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A Case Study of the Muncie, Indiana Water Quality Control Program

Southwest Research Inst.
San Antonio, TX

Prepared for

Robert S. Kerr Environmental Research Lab.
Ada, OK

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June 1982

A CASE STUDY OF THE MUNCIE, INDIANA WATER QUALITY CONTROL PROGRAM

by

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Grant No. R805528-01

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in cooperation with the
Division of Water Quality
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U.S. ENVIRONMENTAL PROTECTION AGENCY
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16. ABSTRACT

Detailed information about the establishment, administration, and effectiveness of a water quality control program currently being operated to serve the community of Muncie, Indiana, population about 100,000, is summarized by this project.

The purpose of this case study was to gather and publish information that could be disseminated for use by other communities of similar size in establishing and conducting, or perhaps expanding, their own water pollution control program. Implementation of this program has greatly reduced the heavy-metal concentrations in the sludge produced by the treatment plant. Additionally, revenues generated from an industrial surcharge program averaged $45,849 per year over a 6-year period. Approximately one-third of the program's budget is chargeable to its industrial monitoring and surcharge functions.

There are approximately 2500 communities nationwide with publicly owned treatment works that are required to establish and maintain an EPA-approved water pollution control program similar to the one reported in this case study. It is likely that details of this report will benefit other communities of similar size and characteristics.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Activated Sludge Process	Priority Pollutants	68D
Industrial Waste Treatment	Treated Effluent Discharge	
Industrial Wastes	Effluent Loadings	
Waste water	Economics	
Waste Treatment	Municipal Waste	
Sludge	Wastewater Management	
Environmental Engineering	Combined Industrial Municipal Treatment	

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FOREWORD

The Environmental Protection Agency was established to coordinate administration of the major Federal programs designed to protect the quality of our environment.

An important part of the agency's effort involves the search for information about environmental problems, management techniques and new technologies through which optimum use of the nation's land and water resources can be assured and the threat pollution poses to the welfare of the American people can be minimized.

EPA's Office of Research and Development conducts this search through a nation wide network of research facilities. As one of these facilities, the Robert S. Kerr Environmental Research Laboratory is responsible for the management of programs including the development of data relative to the pretreatment of industrial wastes and the fate of priority pollutants at publicly owned wastewater treatment plants.

The treatment of wastewaters by industry discharging to municipal treatment plants has been practiced for many years. The municipalities where these industries are located have also implemented local programs aimed at controlling industrial contributions of various pollutants. However, many cities and their local industries have not addressed the needs to manage these wastes in a manner which will protect the treatment plant and the surrounding environment from damage and contamination. U.S. Congressional concern for proper pretreatment of industrial wastes was expressed in PL 92-500, the 1972 ammendments to the Federal Water Pollution Control Act. PL 92-500 and subsequent pretreatment regulations require compliance with national pretreatment standards. Municipalities covered by these regulations are required to develop pretreatment programs to manage industrial dischargers using the treatment plant. EPA estimates approximately 2500 communities will be affected. Many of these cities have not yet established and implemented such a program.

The development and implementation of new local pretreatment programs has created a need for information about existing programs. The purpose of this report is to satisfy this need.

This case study describes the development and implementation of the water quality control programs at Muncie, Indiana.

Clinton W. Hall

Clinton W. Hall
Director
Robert S. Kerr, Environmental
Research Laboratory

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ABSTRACT

This report is a project to prepare a case history of Muncie Indiana's program to control water pollution in the Muncie area. Each program element is discussed in detail. Available historical data are presented which document the changes in heavy metal concentrations in the influent, effluent and sludge produced by the Muncie wastewater treatment plant over a seven year period. Priority pollutant screening results are also presented.

The concentrations of heavy metals in the influent and effluent have generally decreased since 1972, when the industrial discharge control program was initiated in Muncie. Sludge concentrations have decreased substantially. Lead showed the largest decrease, a result of pretreatment by a large lead acid battery manufacturing plant.

This report was submitted in partial fulfillment of Grant R805528-01 by Southwest Research Institute for the Muncie Sanitary District under partial sponsorship of the Environmental Protection Agency. This report covers the period from March, 1978, to January, 1981.

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SECTION 1

INTRODUCTION

In June 26, 1978, the Environmental Protection Agency (EPA) promulgated a new rule (Part 403), "General Pretreatment Regulations for Existing and New Sources of Pollution." This rule establishes mechanisms and procedures for enforcing national pretreatment standards. These standards will control the introduction of industrial wastes into publicly owned treatment works (POTW's). Each POTW having a design flow of more than 5 million gallons per day must develop a pretreatment program to implement the regulations. Such a program will be a condition of the POTW's National Pollutant Discharge Elimination System (NPDES) permit. EPA estimates that approximately 2,500 POTW's will be required to have an approved pretreatment program. Many of these POTW's already have such a program. However, many do not and will have to develop and implement a program which has been approved by EPA or the NPDES permitting authority. Communities wishing to establish new pretreatment programs or to expand existing ones may benefit from knowing what other POTW's have done.

In recognition of this need, the EPA initiated a case study of the Muncie, Indiana, water pollution control program. This report presents the results of the case study. By describing the various aspects of Muncie's program, it is hoped that other cities interested in establishing or expanding a local water pollution control program will benefit from Muncie's experience.

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SECTION 2

SUMMARY

The Muncie Sanitary District (MSD), Muncie, Indiana, initiated a total program to control water pollution in 1972 by establishing a new Division of Water Quality (DWQ). The DWQ provided the MSD flexibility to monitor water quality and establish standards, control industrial dischargers, and enforce pretreatment regulations.

To establish an industrial discharge control program, the DWQ personnel visited each plant within its boundaries to evaluate discharge characteristics and spill potentials. This approach is recommended for all communities of similar size to Muncie.

The industrial surcharge program revenues from 1973 through 1979 totaled $327,942. Average revenue per year was $46,849. Approximately one-third of the DWQ budget, or $95,243, is chargeable to the industrial monitoring and surcharge program. This cost amounts to 87 cents per person served by the MSD.

Implementation of the MSD industrial discharge control and pretreatment program has reduced the heavy metal concentrations in the sludge produced by the treatment plant. Present concentrations of chromium, copper, nickel, zinc, and lead are below reported mean values for typical municipal sludges reported by EPA. These reductions mean that Muncie will require less land area to dispose of sludge by land application. For example, in 1974, the MSD treatment plant was producing sludge containing 142 pounds (lbs)/day of lead, or approximately 26 tons/year. In 1978, lead concentrations decreased to 4 lbs/day or .73 tons per year. Using proposed EPA land application criteria, land requirements would have decreased from 52 acres to 1.5 acres. The decreases in metal concentrations in the MSD sludge since initiation of the industrial monitoring and control program have decreased the ultimate amount of land needed for land application (based on metal loadings), possibly making land application an economically feasible option for the MSD to continue into the future.

SECTION 3

DEVELOPMENT OF THE DIVISION OF WATER QUALITY

BACKGROUND

Muncie, Indiana, is a typical midwestern community having a population of approximately 100,000. Located north of Indianapolis, Muncie has a significant industrial sector employing over 30 percent of the local work force. The White River flows through the city, ultimately receiving the storm runoff, as well as the effluent from the wastewater treatment plant.

In March, 1972, Muncie initiated a "total" program to control water pollution at the local level. The Division of Water Quality (DWQ) was established as the fifth department of the Muncie Sanitary District (MSD). With the addition of the DWQ, the MSD program became a "total" approach because now the MSD had the additional flexibility to monitor water quality, establish standards, control industrial dischargers and enforce pretreatment regulations. Protection of the Muncie water resources could now be performed by a local agency responsible to the citizens of Muncie. This approach is analogous to fire or police protection at the local level. Protection of the water resources in Muncie should be the responsibility of Muncie residents. Only when the local agency fails to provide this service should state or Federal agencies step in. A brief review of the MSD formation and how the DWQ fits in will be useful.

MUNCIE SANITARY DISTRICT

In 1963, the state of Indiana enacted a statute (Sections 48-4265a through 48-4265f of the Acts of 1963) enabling Muncie to establish a sanitary district and to charge for its services. The MSD was created in 1964 through city ordinance 1636 with the following purposes:

"(1) To provide for the collection and sanitary disposal of sewage, the collection of trash and garbage, and the drainage of storm water in such manner as to protect the public health, safety and welfare.

(2) To prevent the undue pollution of rivers, streams and water courses and other water.

(3) To continue to utilize a system of charges for sewage facilities to provide revenue for constructing and operating sewage treatment works, and sewer mains connected to such treatment works and retirement of bonds for the construction of such sewage treatment works and connecting mains, including the collection of delinquent charges.

(4) To stimulate metropolitan growth by providing an adequate sewer system, trash and garbage collection, and drainage facilities through a direct tax levy and expanded bonding capacity.

(5) To preserve to bond holders of any revenue bonds issued by the city and outstanding at the time of this act the same rights and privileges as existed prior to this act."

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The organization chart in Figure 1 depicts the MSD as it is today. When it was established in 1964, the DWQ did not exist. The functions of the MSD at that time were as follows:

(1) Operate the Muncie wastewater treatment plant;

(2) Operate the refuse collection program;

(3) Bill customers for water and sewage charges; and

(4) Plan for additional wastewater treatment plant facilities when necessary to meet growing water usage and resulting sewage flow.

The MSD, being larger than the boundaries of the city of Muncie, encompasses nine bodies of water. They are the White River, Buck Creek, Holt Ditch, Truitt Ditch, Greenfarm Ditch, Jakes Creek, Muncie Creek, 32 Ditch, and Lennox Creek. These all flow into the White River. With the formation of the MSD, Muncie now had one agency responsible for controlling water pollution. To meet this objective, heavy emphasis was placed on the operation of the wastewater treatment plant. As the city grew, industrial contributions to the wastewater treatment plant increased, as did domestic sewage flow to various tributaries to the White River, causing water quality problems.

At the time the MSD was established, its main function related to water pollution control was to operate the wastewater treatment plant and perform required testing of effluent quality for the Indiana Stream Pollution Control Board. The MSD did not have sufficient staff to monitor water quality problems in the White River and the various tributaries. Only the largest industries discharging into the POTW were monitored. The MSD had an ordinance prohibiting discharge by industry of foreign substances into the sewer system which would cause damage to the sewerage system or to the wastewater treatment plant. However, the ordinance did not address substances such as heavy metals or other toxic compounds. The MSD relied on the staff of the wastewater treatment plant to enforce the ordinance. This responsibility was in addition to normal duties of running the plant. Between 1964 and 1972, there was no formal industrial waste pretreatment program. As shown in Figure 1, prior to 1972 the MSD had four departments; these were Accounting, Engineering, Wastewater Treatment Plant and Sanitation.

DIVISION OF WATER QUALITY

Muncie's present program to control industrial dischargers to the MSD wastewater treatment system was formally initiated on March 10, 1972, with the formation of the DWQ. The DWQ was established as the fifth department within the framework of the MSD. It provided the MSD with a formal mechanism to manage local water resources. A director, reporting directly to the MSD Board of Commissioners, was named to head the DWQ. An organizational chart is shown in Figure 2.

The initial responsibilities of the DWQ were as follows:

(1) Perform all laboratory testing for the wastewater treatment plant;

(2) Monitor the industrial dischargers using the MSD sewerage system and wastewater treatment plant;

(3) Enforce the applicable MSD ordinances relating to sewer use and pretreatment and develop new ordinances if necessary;

(4) Prepare spill control and countermeasure capabilities to minimize water pollution andor fish kills in the event of a spill;

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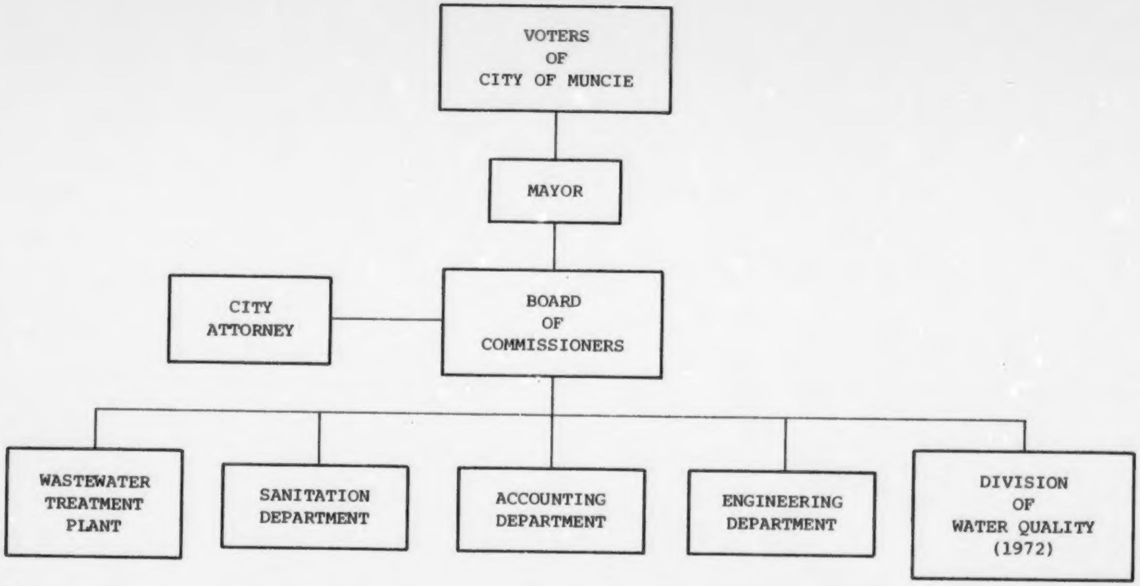
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WASTEWATER TREATMENT PLANT
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ACCOUNTING DEPARTMENT
ENGINEERING DEPARTMENT
DIVISION OF WATER QUALITY (1972)

Figure 1. Organizational chart—Muncie sanitary district.

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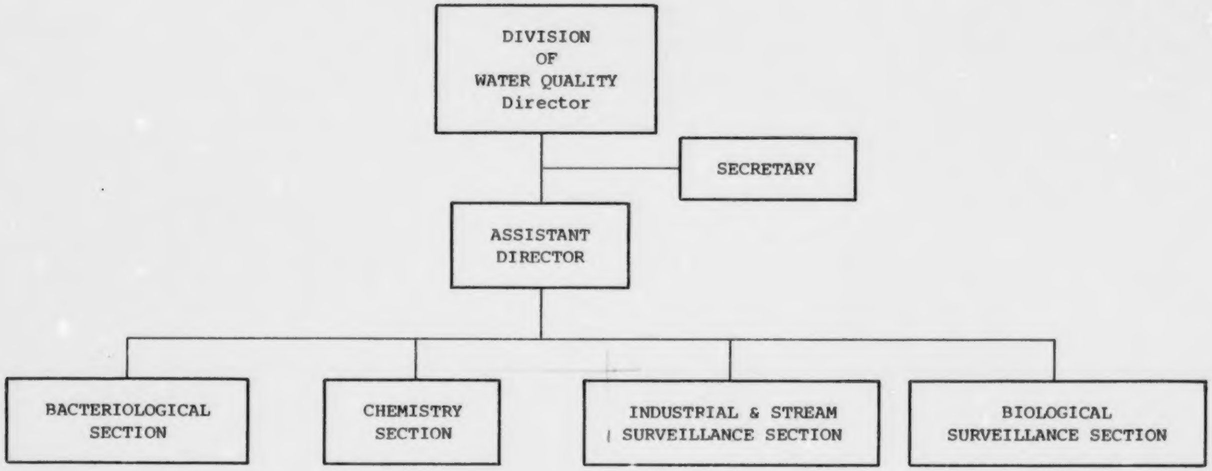
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BIOLOGICAL
SURVEILLANCE SECTION

Figure 2. Organizational chart—Division of Water Quality, Muncie Sanitary District.

(5) Conduct research investigations of heavy metal concentrations in fish from the White River and the eight tributaries within the MSD;

(6) Assume responsibility for testing local community operated swimming areas for bacterial safety;

(7) Perform any scientific research in the aspects of water pollution necessary for the MSD to fully meet its responsibilities to the Muncie area citizens;

(8) Conduct workshops when requested to assist other communities to establish or improve local water quality programs; and

(9) Monitor all streams and identify illegal dischargers within the MSD boundaries, and clean them up.

The decision to establish the DWQ as an "organizational" equal with other departments within the MSD was very significant. This meant that the activities of the DWQ became administratively and budgetarily independent from other departments within the MSD. This arrangement has proven to be a significant factor in the success of the DWQ. It represents a somewhat uncommon organizational arrangement when compared to many other cities. Often the functions of a department like the DWQ are under the jurisdiction of the Superintendent of the POTW. The Director of the DWQ must answer only to the MSD Board of Commissioners. He must prepare budget requests each fiscal year with justification. By establishing the DWQ as an organizational "equal" to the other departments, the Commissioners demonstrated the importance they placed on the mission of the DWQ. This act also placed the activities and staff of the DWQ in full view of the Commissioners, the public, and other department managers.

SECTION 4

DIVISION OF WATER QUALITY PROGRAM ELEMENTS

INDUSTRIAL DISCHARGE CONTROL PROGRAM

Need for the Program

In 1972, the need for a formal industrial discharge control program in Muncie was based on the recognition of five factors. These were:

(1) A significant industrial sector existed in Muncie and discharged an unknown quantity of wastewater of an unknown quality into the MSD treatment plant and various tributaries to the White River;

(2) Existing heavy metals data for plant influent and sludge suggested relatively high metals concentrations, particularly for lead;

(3) NPDES and construction grant regulations would require an adequate industrial discharge control program;

(4) A method was needed to assure that all non-domestic users of the MSD system were assessed fees in a fair and equitable manner; and

(5) The receiving stream for MSD treatment plant effluent was particularly sensitive due to annual low flow conditions with no dilution during the summer.

In recognition of these factors, the DWQ initiated the development of a program to control the discharges of industrial wastes into the streams within the MSD boundaries as well as the discharges to the MSD wastewater treatment plant.

Program Objectives

The overall objectives of the industrial discharge control program were as follows:

(1) Minimize potential upset conditions at the treatment plant due to industrial discharges;

(2) Minimize incompatible pollutants from passing through the treatment plant to the White River;

(3) Minimize treatment plant sludge disposal problems caused by excessive concentrations of toxic materials;

(4) Establish and maintain a data base sufficient to calculate sewer use surcharge fees; and

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(5) Prevent water quality violations resulting from illegal direct discharges into surface waters within the MSD jurisdictional boundaries.

Data Base Development

A useful data base on non-domestic users of the MSD system involved a variety of information, including process descriptions, raw materials and products, plant layout, personnel, water usage, and a complete effluent quality profile. The more accurate this information, the more fairly the pretreatment program can be implemented. An accurate data base which is continually updated is critical to the long term viability of the program. This is due to the fact that decisions regarding surcharge fees and enforcement of discharge standards must be based on accurate information. If not, the credibility of the program suffers. This leads to lack of community and industrial cooperation and program failure.

There are various approaches to develop an acceptable data base. With respect to effluent quantity and quality, the DWQ chose to collect and analyze the samples in the DWQ laboratory. This approach was selected because the staff believed it would provide the most reliable and consistent results. Obviously, this approach is more costly and time consuming for the DWQ than, for example, requiring each user to furnish such data.

Shortly after the DWQ was established, the Director began the first step in the process of developing an industrial user data base. Files were developed for each known or suspected industrial discharger to the MSD system. Information was obtained from existing files of the wastewater treatment plant, industrial directories of the Chamber of Commerce, and water department billing records. Every possible discharger was included.

The next step was to visit each industry, beginning with the known users of the MSD system. The purpose of the on-site inspection program was two-fold. First, to visit each potential discharger to determine if the physical plant, storage practices and operations might result in accidental spills of toxic or otherwise unwanted materials to the sewer system. Often, manufacturing facilities, even though they may not normally produce a wastewater discharge, utilize materials which could enter the sewerage system. Secondly, known dischargers were visited for the purpose of touring the manufacturing process with appropriate plant personnel. Water uses and probable contaminants in the discharge were identified. This information was used to determine the subsequent monitoring and analysis program.

Additionally, each visit served as an opportunity for DWQ staff to meet the industrial personnel responsible for plant operation. This is an important aspect of the data base development effort. No sampling was performed during this initial visit. However, the locations for subsequent sampling were identified. Visits served as an opportunity to walk through each industrial facility and understand the various manufacturing processes, the types of wastes generated, resulting flows, etc. Available historical data on discharge water quality was reviewed during the visit and copies were obtained when possible.

Visiting each plant proved to be a successful means of obtaining the general information needed to evaluate each industry as a user of the MSD system. This approach is recommended for all communities similar to Muncie where the total number of industrial users can be visited on a personal basis within a reasonable time. Several significant advantages accrued to the DWQ as a result of the on-site visits. Those were:

(1) An opportunity for the DWQ Director to discuss and explain his program face to face with each plant manager or company president;

(2) The opportunity for industry personnel to comment on the DWQ program and express viewpoints; and

(3) The chance for the Director to see firsthand the manufacturing processes which generated the wastewaters.

Upon completion of the plant visits, all information collected was reviewed to determine the appropriate order in which the plants would be sampled. The plants known to discharge industrial wastes were scheduled for sampling ahead of those suspected of discharging industrial and domestic wastes. They were ranked to determine the priority of the field sampling program. Ranking was based upon the following criteria:

(1) Type of waste constituents - toxics receiving higher priority;

(2) Flow volume or water usage

(3) Access to sampling points; and

(4) Availability of existing data.

For each plant on the list, the sampling times were established as well as the number and type of samples to be taken. In some cases, it was necessary to collect samples for organic analysis and metal analysis. Others required organic analysis only. For plants that were operated 24 hours per day, composite and/or individual 24-hour samples were taken.

All sampling and analysis was performed by DWQ personnel. When requested by the industry, samples were split with that industry for comparison of results. DWQ staff was used for the following reasons:

(1) High degree of quality control could be maintained over sampling techniques and laboratory methods; and

(2) Some of the dischargers lacked the necessary laboratory capabilities to perform the required sampling and analysis themselves.

The initial effluent quality data base should always be established using results of sampling and analysis performed or controlled by the regulating authority.

Ordinance

At the time the DWQ was established, the MSD had a sewer use ordinance which provided for inspection of dischargers by MSD representatives, as well as pretreatment of industrial wastes. This ordinance was originally prepared by the MSD Engineering Department shortly after the MSD was established in 1964. Section 50.06, "Inspection of Private Systems," provided the DWQ the necessary authorization to inspect all known or potential dischargers and to collect effluent samples for analysis. Section 50.08 of the ordinance also prevented the discharge of certain pollutants in amounts which would result in "pollution of the receiving waters downstream from the sewage treatment plant." Specific discharge concentration limits did not exist for toxic parameters. However, the DWQ did use, from 1972-1976, a recommended list of effluent limits for industry to meet. Application of these limits resulted in a significant decrease in metal concentrations in the final effluent waste sludge from the wastewater treatment plant.

Section 50.09, "Pretreatment of Industrial Wastes," provided that the discharge of wastes having a five day biochemical oxygen demand BOD_5 or containing total suspended solids (TSS) in excess of 300 mmilligrams per liter (mg/l) or having an average daily flow greater than two percent of the plant flow were subject to review and approval by the MSD. Pretreatment could be required where necessary in the opinion of the MSD. Plans and specifications for such facilities would be submitted for MSD approval.

These provisions of the ordinance established the basis for the DWQ industrial users program as established in 1972. However, the existing ordinance did not specify allowable effluent concentrations of toxic pollutants such as metals and cyanide. Additionally, there were no provisions for a surcharge program which

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would charge users of the system discharging wastes exceeding 300 mg/l of BOD_5 and TSS their fair share of any resulting additional treatment costs.

Based upon results of the DWQ industrial waste surveys initiated in 1972, an amendment to the city sewer use ordinance was passed in 1973. The "Industrial Users Charge" amendment to Section 50.28 provided for a "surcharge in addition to the regular sewerage service charge based on the BOD_5 or chemical oxygen demand (COD) and TSS content of the wastes." Thus, any discharger whose waste strength exceeded 300 mg/l BOD_5 or 600 mg/l COD and 300 mg/l TSS was subject to a surcharge fee. The rates of surcharge were established as follows:

(1) For BOD_5 in excess of 300 mg/l, $.018/lb;

(2) For TSS in excess of 300 mg/l, $.016/lb; and

(3) For COD in excess of 600 mg/l, $.018/lb.

The water meter readings were to be used to establish flow volumes to be used to compute the surcharge. Once every three months, each discharger is sampled for five consecutive days using a 24-hour composite sampler. The analytical results of the five samples are averaged, and used to compute the surcharge. Each industry is billed quarterly.

In the event of multiple discharge points from one user, each discharge was measured. Flows were determined by measurement or process usage. Process change which affected effluent quality would result in resampling, which could be initiated by the user or the MSD.

The amendment also provided that prior to April of each year, the Director of the DWQ and the plant superintendent must submit to the Board of Sanitary Commissioners a detailed report showing the cost of removing BOD_5 and/or COD and TSS for the previous year. The purpose of this report was to provide the Board with the data needed to determine if current rates of surcharge were adequate.

The amended ordinance passed in 1973 served the needs of the MSD until 1976. To comply with administrative provisions of the Indiana Stream Pollution Control Board and the EPA construction grant regulations, a new water pollution control ordinance, rate ordinance and industrial cost recovery ordinance were proposed by the MSD and were passed by the Muncie City Council. These ordinances are attached as Appendices A and B. The MSD presently operates using these ordinances.

Appendix A, the Industrial Water Pollution Control Ordinance, is comprised of eight chapters. This ordinance is completely self-contained, i.e., it contains the necessary general provisions, rules and regulations to stand alone as a control ordinance. The ordinance evolved over a three year period. Each chapter is discussed below.

Chapter 1 - General Provisions--

Chapter 1 states the overall purposes of the ordinance. They are:

(1) To establish certain uniform requirements for all users of the MSD collection and treatment system;

(2) To enable the MSD to comply with administrative requirements and applicable effluent standards of the state and Federal agencies; and

(3) To derive maximum public benefit from the operation of the MSD system by distributing costs of operation equitably to all users.

This chapter also defines the various terms used in the ordinance.

Chapter 2 - Regulations--

The regulations necessary for the MSD to implement the ordinance are described in Chapter 2. General prohibited practices which govern discharges to the MSD system include discharging substances which cause or threaten to cause damage to or upset of the system. Damages include fire, explosion, obstruction of flow, danger of life or safety of MSD personnel, and overloading of equipment. The intentional introduction of storm drainage and groundwater is prohibited. Generally, other prohibited waste discharges include unpolluted water and radioactive wastes. Provisions are included which allow the DWQ to make exceptions (in most cases) on an individual basis.

The most important regulation with respect to industrial discharges limits the strength of wastewater. The regulated parameters with the average and maximum discharge limits are shown in Table 1.

TABLE 1. LIMITATIONS ON WASTEWATER STRENGTH

Pollutant	Daily average concentration (mg/l)	Maximum concentration (mg/l)
Total Cadmium	0.2	0.6
Total Copper	2.0	6.0
Total Lead	2.0	6.0
Total Nickel	2.0	6.0
Total Chromium	2.0	6.0
Total Zinc	4.0	12.0
Total Cyanide	2.0	6.0

In addition, wastewater discharges cannot exceed a temperature of 65.5°C.

The establishment of these limitations at Muncie was based upon many years of monitoring of not only the industrial contributors, but also the POTW's influent, effluent, sludge, and water quality above and below the plant, urban runoff, and parking lot runoff. Developing specific metal limitations requires a knowledge of the metals loading to the plant from industry, the actual removal capabilities of the wastewater treatment plant, sludge disposal requirements, and receiving stream water quality.

To develop these criteria, the DWQ primarily utilized data collected between 1972 and 1976. All of the industrial contributors had been identified and sampled. A baseline stream monitoring program (which is discussed in Section 4) was established in 1972, so information was available on the impact of the MSD discharge on water quality. There were no limitations imposed on the MSD by the NPDES program with respect to metals, so this was not a factor. Data were available defining the ability of the treatment plant to remove metals. These data are presented in Section 6.

Using this information, the DWQ established the discharge criteria. Comments from industry were received and considered prior to promulgation. The maximum discharge limitation of three times the daily average recognized fluctuations expected from industrial pretreatment or manufacturing facilities. However, maximum concentrations of this magnitude would not adversely affect the plant operation.

Chapter 3 - Wastewater Volume Determination--

This chapter gives the DWQ several options in determining the volume of wastewater discharged by users. When the user has a water meter, the user charges are based upon water use. Allowances can be

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made when certain portions of water purchased is not diverted to the sewer. An example would be a food processor, where some percentage of water used goes into the product. This chapter also allows the DWQ to estimate wastewater flow. These options are necessary for the DWQ to fairly assess the user charges.

Chapter 4 - Administration--

The various administrative procedures available to the DWQ are defined in this chapter. Discharge reports are required by all dischargers violating certain provisions of the ordinance. Major users must obtain authorization to connect to the MSD system. Major users are defined as follows:

(1) Having an average daily flow of 50,000 gallons or more; or

(2) Having a flow greater than five (5) percent of the flow in the MSD system; or

(3) Having toxic pollutants in toxic amounts defined in Section 309(a) of PL 92-500; or

(4) Having a significant impact on the treatment or collection system either individually or in combination with other industrial dischargers.

The ordinance identifies the forms and required information that users seeking authorization must complete. The DWQ may impose certain restrictions and conditions on any major user, including effluent quality, flow volume, and monitoring requirements. Discharge authorizations cannot be transferred or sold to a new user, different premises, or a new operation.

The DWQ may require the user to construct monitoring facilities to allow DWQ personnel access for sampling flow measurement. Agency personnel may also inspect the facilities of any user at any reasonable time. Facilities include all manufacturing areas. Plans and specifications for pretreatment facilities proposed by users must be submitted to the DWQ before construction begins. The DWQ must be notified 48 hours prior to startup of new or modified pretreatment facilities. Spill containment facilities, when appropriate, must be provided by each user. Specific plans for such facilities must be submitted and approved by the DWQ. When a spill to the sewerage system does occur, the user must notify the DWQ immediately.

All information maintained in the files of the DWQ about each user is available to the public. The ordinance does allow such information to be held in confidence. The user must justify the need for keeping such data confidential. However, data for wastewater discharge quality will not be held confidential under any circumstances.

The last section of Chapter 4 provides the DWQ with additional flexibility in implementing the provisions of the chapter. This section allows special agreements to be made between users of the MSD system and the DWQ relative to any provisions of Chapter 4. This is important to both the DWQ and the user. Circumstances may arise which are not specifically spelled out in the language of the ordinance.

Chapter 5 - User Charges for Excess Strength of Waste--

This chapter establishes the user surcharge program. Each user is subject to the program. The surcharge is paid in addition to the regular sewage service charge. This chapter changed the basis for calculating the surcharge fee as defined in the amendment to Section 50.28 which was previously discussed. Surcharges are now applicable when wastes have a concentration in excess of 250 mg/1 BOD_5 or TSS. The determination of surcharge fees included in the 1973 amendment 4050.08 was adopted in the 1976 ordinance.

Chapter 5 defines the sampling and testing procedures for the surcharge program. Calculation of the actual surcharge in dollars is based on the excess lbs of BOD_5 and/or TSS over normal sewage strength. The rates in dollars per excess lb are stated in Section 3, Part A of the Confirming Resolution which is attached as Appendix B.

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Chapter 6 - Enforcement--

This chapter establishes the director of the DWQ as the agent for the MSD to assure that the provisions of the ordinance are implemented. All dischargers are required to notify the director immediately upon discharge of wastes violating the ordinance. This applies to accidental spills as well as continuous discharges. An explanation of the circumstances causing the spill and proposed corrective measures to prevent reoccurrence must be submitted within 15 days following the incident.

The director is authorized to issue cease and desist orders to users violating provisions of the ordinance. Such an order may direct the user to comply with the ordinance in accordance with a time schedule aggreeable to both parties.

A user of the MSD system affected by the enforcement of the ordinance provision may write to the Director for reconsideraiton. This must be done within 10 days after the decision. The request must justify reconsideration of the action and include discussion of the pertinent facts of the case. Should the request for reconsideration be denied, or a ruling be made which is unsatisfactory to the user, written appeal can then be made within 10 days to the Commissioners of the MSD. The Commissioners must consider the appeal within 30 days, and render a decision 10 days after the hearing. *During this entire appeals process, the initial decision by the Director remains in effect.*

Chapter 7 - Abatement--

Disharges to the MSD system which violate the ordinance are deemed a public nuisance. This is a very significant part of the ordinance, since most communities have public nuisance laws which can be enforced locally. In addition, the MSD may petition any court having jurisdiction for the issuance of an injunction to prevent the continuance of an illegal discharge. The MSD may terminate service to any user for violation of ordinance provisions.

Persons found guilty of intentionally or negligently violating any provision of the ordinance or administrative orders are subject to criminal penalties. Monetary fines up to $1,000 per day of violation and/or imprisonment up to six months may be assessed. Intentional falsification of information submitted to the MSD carries a fine not to exceed $1,000. The MSD may assess a monetary charge against any user for work required to correct or repair damages to the MSD facilities resulting from a user's discharge.

Chapter 8 - Severability— —

This chapter protects the remainder of the ordinance from being held invalid should any specific provision be held invalid.

Appendix B, the rate and industrial cost recovery ordinance, is comprised of two parts, A and B. Part A establishes rates and charges for the treatment of sewage by the MSD. Part B establishes the industrial cost recovery system as required by the U.S. EPA. Basicially, this system was intended to recover from industrial users of the MSD system that portion of the EPA construction grant for advanced wastewater treatment facilities necessary to treat those industrial wastes. For details regarding industrial cost recovery, please refer to Appendix B.

Monitoring Program

Effective implementation of the industrial waste control program requires the continuous collection of data defining the characteristics of the industrial users of the MSD system. The DWQ has developed an approach to industrial monitoring over the past seven years that provides the mechanism for obtaining information about industrial contributors.

Data obtained from the industrial monitoring program are used for the following purposes:

(1) To determine compliance with the pretreatment standards contained in the Industrial Waste Control ordinance;

(2) To determine the appropriate user surcharge fees

(3) To support appropriate enforcement action when necessary;

(4) To complete reports and forms for the DWQ and state federal agencies; and

(5) To provide a data base to justify modifications to the existing ordinance when appropriate.

The program of the DWQ has evolved as part of the "total approach" and therefore functions to complement and be compatible with other DWQ and MSD responsibilities. There exists constant formal as well as informal exchange of information between the DWQ and other divisions within the MSD. The plant operators may discuss operational problems with DWQ personnel, which may result in a review of possible changes to ordinances, for example, or industrial monitoring may be useful in predicting changes in influent to the plant, which would potentially change effluent and sludge quality.

The industrial monitoring program of the DWQ has the following basic components:

(1) Monitoring schedule;

(2) Field sampling; and

(3) Laboratory analysis.

Monitoring Schedule--

The DWQ presently monitors approximately 30 industrial dischargers on a routine basis. All dischargers are checked a fixed number of times each quarter. Sampling schedules are planned for each month. Dischargers never know when they will be sampled. Eight of these are monitored for determining surcharges. The remainder are monitored to determine compliance with the ordinance provisions. Four of the eight industries receiving surcharge assessment are sampled a total of seven times during each three month billing period. Twenty-four hour samples are taken on a random basis each quarter. Sampling is performed by the Industrial and Stream Surveillance Section of the DWQ. Two people perform all sampling during each quarter. Normally, equal volume refrigerated automatic samplers are used. The first five valid results on these seven samples are used to compute the surcharge. Water use records for each period and the arithmetic average of the five valid samples are used to calculate the appropriate surcharge.

The surcharge assessments for the remaining four industries are presently based on past wastewater strength and actual water usage. Sampling in the past indicated very consistent discharges of BOD_5 and TSS concentrations. Based upon this history, the surcharge for these four is calculated on past records. This saves time and money for the DWQ. Each of these dischargers has agreed to notify the DWQ of any changes in production which might change their discharge characteristics. Spot sampling is performed twice each month by the DWQ as a check on their wastewater strength.

Approximately 22 industries are sampled each month to determine compliance with the ordinance. Sampling schedules vary from month to month. All industries are sampled at the same frequency. Each discharger is sampled twice per month. Normally, 24 hour equal volume composite samples are taken, using the automatic samplers. Grab sampling is used when composites are not indicated.

The DWQ utilizes this approach to monitoring for two reasons:

(1) To obtain the most unbiased, representative sample possible; and

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(2) To allow the DWQ Surveillance Section maximum scheduling flexibility.

Demand monitoring is performed as necessary. Demand monitoring is usually synonymous with some type of emergency at the treatment plant caused by a suspected or known illegal discharge or spill. The treatment plant operators may want to determine the characteristics of the discharge and attempt to identify its source or industry may be aware a spill has occurred and the DWQ may want to determine remedial measures to prevent plant upset.

The DWQ does not require industrial users to submit self-monitoring reports. They do have the authority to request such data. However, the DWQ believes present reliance on their own discharge data results in a more viable program. This approach does increase user program costs, since approximately 15,000 individual analyses are performed each year on industrial discharges to the MSD system. But the net costs to the community are less because one laboratory is performing the analyses and not individual laboratories at each industry.

Field Sampling--
The DWQ Industrial and Field Surveillance Section is responsible for the field sampling of industrial dischargers. Normally, two people handle the required preparation and sample collection. It is the responsibility of those people to establish the monitoring schedule to be followed. This is done at the beginning of each month. Preparation for field sampling involves the following:

(1) Reviewing pertinent information about each discharger to be sampled on that day. This includes sampling location, a list of parameters requiring analysis, sample volumes required, necessary sample containers and sampling equipment (such as automatic samplers) and required power supply hookups; and

(2) Determining the logistics of sampling if more than one discharger is to be sampled that day.

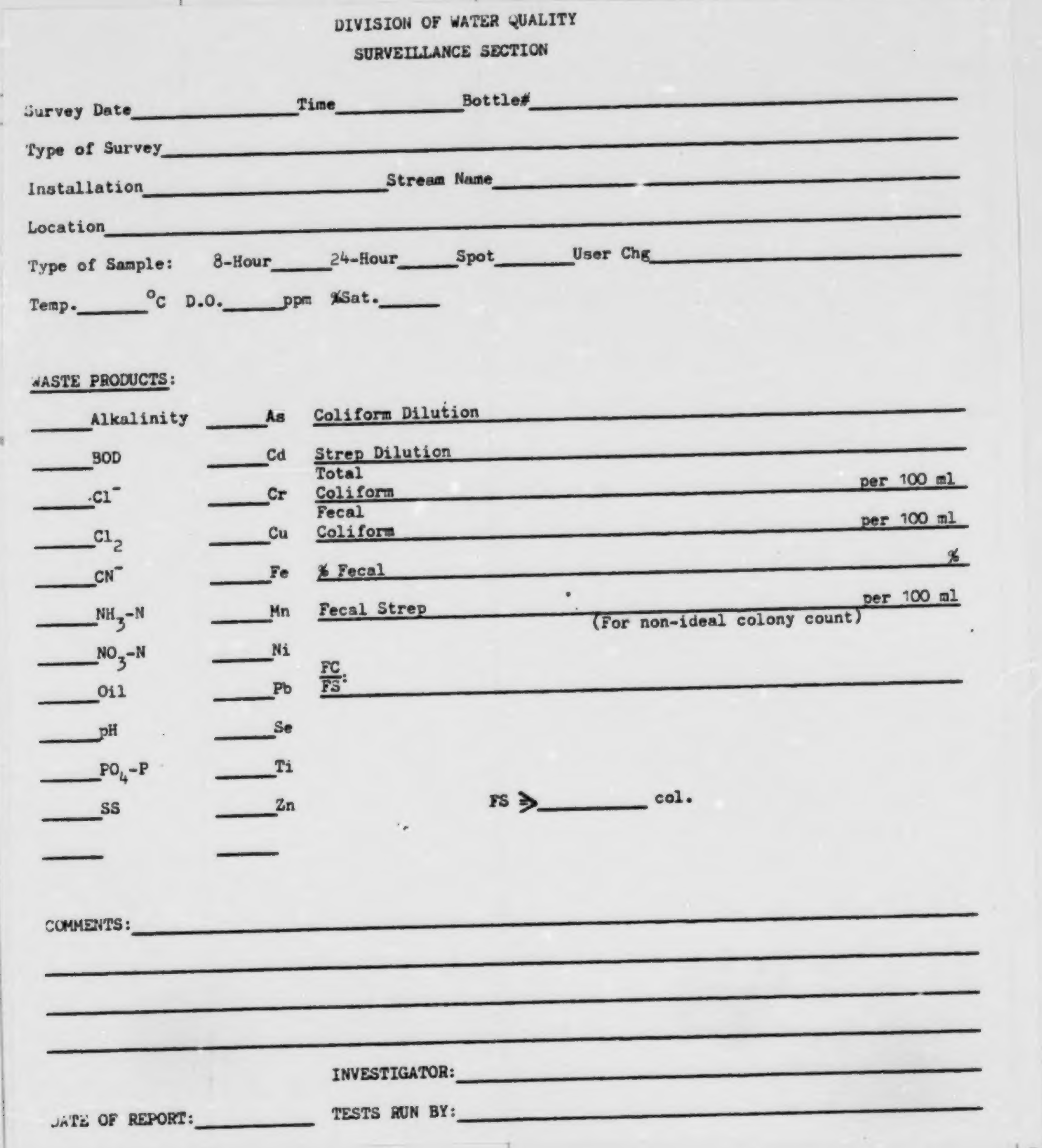
Under normal circumstances, this procedure becomes routine once the particulars of each discharger are familiar.

The DWQ maintains six automatic samplers for compliance monitoring. These are all timed samplers which collect either equal volume composite samples or individual samples at pre-selected intervals. The equal volume composite sampler is used most frequently. The DWQ has found that loadings determined from samples taken with this machine produce a representative sample of the wastewater discharges.

The DWQ has established agreements with each discharger which allow field personnel access at all times to sampling locations on private property. This is a necessary arrangement, since the dischargers are not notified of sampling times in advance.

After planning each sampling effort, the necessary equipment is taken to the site. If automatic samplers are used, the unit is connected to the power source and is checked out. Sampling is then initiated. The unit is routinely checked periodically throughout the sampling period. During this period, sampling personnel are not stationed at the site at all times. The field crew is responsible for necessary sample preservation as well as making sure adequate sample volume is obtained. BOD_5 samples are refrigerated. Collection and sampling techniques are performed in accordance with approved EPA methods.

Once the sample has been obtained, the field crew completes a field sheet which serves as a record log for that sample. The record sheet includes the time, date, and location of sampling and other observations. A tally sheet is kept for each discharger to track sampling. The field sheet is necessary to (1) assure that samples are not lost, and (2) provide the laboratory background data to aid in the analysis of the sample. It also enhances the credibility of the results. This is important because the decision to initiate further monitoring for possible enforcement action may be initiated based on the results. An example field sheet is shown in Figure 3.



DIVISION OF WATER QUALITY
SURVEILLANCE SECTION

Survey Date__________ Time________ Bottle#__________

Type of Survey__________

Installation__________ Stream Name__________

Location__________

Type of Sample: 8-Hour____ 24-Hour____ Spot____ User Chg__________

Temp.____ °C D.O.____ ppm %Sat.____

WASTE PRODUCTS:

____ Alkalinity	____ As	Coliform Dilution __________
____ BOD	____ Cd	Strep Dilution __________
____ Cl^-	____ Cr	Total Coliform __________ per 100 ml
____ Cl_2	____ Cu	Fecal Coliform __________ per 100 ml
____ CN^-	____ Fe	% Fecal __________ %
____ NH_3-N	____ Mn	Fecal Strep __________ per 100 ml (For non-ideal colony count)
____ NO_3-N	____ Ni	
____ Oil	____ Pb	$\frac{FC}{FS}$: __________
____ pH	____ Se	
____ PO_4-P	____ Ti	
____ SS	____ Zn	FS ≥ ________ col.
____	____	

COMMENTS:__________

INVESTIGATOR:__________

DATE OF REPORT:________ TESTS RUN BY:__________

Figure 3. Field data collection sheet.

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Laboratory Analysis--

The DWQ maintains a complete analytical laboratory which serves the needs of the industrial monitoring program of the DWQ. The laboratory is an essential aspect of the "total program" of the DWQ since it provides the mechanism for quick and reliable analysis of samples. An added benefit of having a competent chemistry laboratory is the credibility it establishes with the industrial sector. This is very important when it comes to solving problems related to the discharges exceeding ordinance limitations. These solutions often cost the user time and money. Willingness to work with the DWQ toward a solution depends to a large degree on the credibility that the DWQ has with the industry.

The Chemistry Section completes a record sheet for all samples received from the Industrial and Field Surveillance Section field crew. The record sheet is shown in Figure 4. The field sheet serves as a record of where and when the sample was taken, and what analyses must be performed. The sample is then processed immediately or is stored for future analysis. The Chemistry Section follows analytical procedures outlined in three references. These are:

(1) "Manual of Methods for Chemical Analysis of Water and Wastes," published by the EPA Technology Transfer

(2) "Standard Methods for the Examination of Water and Wastewater," 14th Edition published by the American Public Health Association

(3) "Annual Book of Standards, Part 31, Water, Atmospheric Analysis, 1975," published by the American Society for Testing and Materials (ASTM).

The laboratory maintains an internal quality control program to insure reliability of the data. The program involves routine tasks applied to all analytical tests as well as checks on all instrumentation and laboratory services. The laboratory participates in the EPA Region V Laboratory Quality Control Program where pre-analyzed samples are used to test accuracy of techniques. Quality control reference documents used by the laboratory include "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" published by the EPA Technology Transfer Program, and the EPA document entitled "Methods for Chemical Analysis of Water and Wastes," also published by the EPA Technology Transfer Program.

The following list describes the major equipment available to the Chemistry Section. Minor equipment such as glassware, etc., is not listed.

(1) Perkin Elmer Model 910 GC with
    - Electron capture detector
    - Flame ionization detector
    - Flame photometric detector
    - Model 1 computing integrater
    - Dual channel, dual pen recorder

(2) Thermolyne Muffle Furnace Type 1400

(3) Napco Drying Oven Model 410

(4) Sartorius Analytical Balance Type 2492

(5) Voland Analytical Balance Model 160-BA

(6) Orion pH Meter Model 701

(7) B&L Model 710 Spectrophotometer

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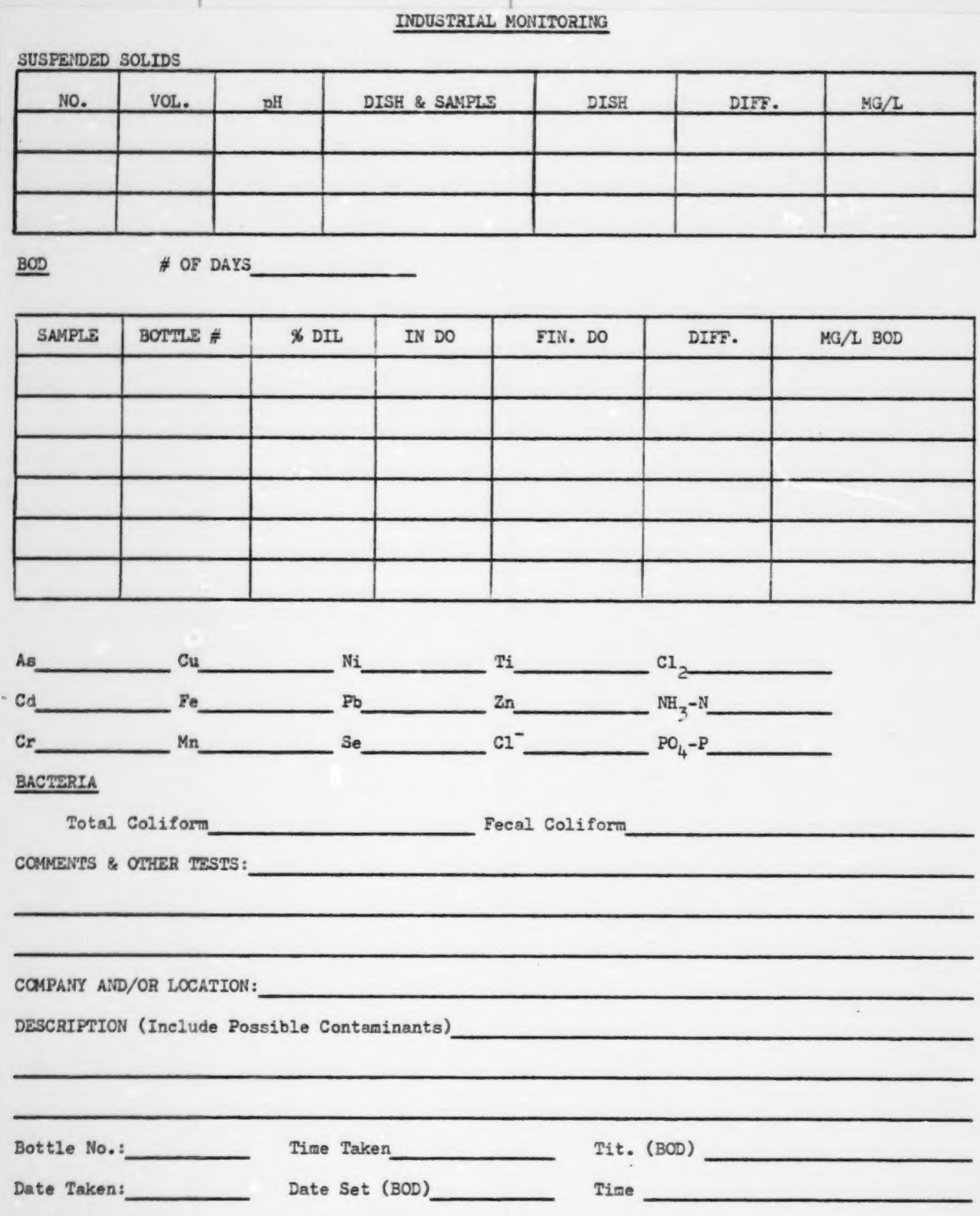

INDUSTRIAL MONITORING

SUSPENDED SOLIDS

NO.	VOL.	pH	DISH & SAMPLE	DISH	DIFF.	MG/L

BOD # OF DAYS____________

SAMPLE	BOTTLE #	% DIL	IN DO	FIN. DO	DIFF.	MG/L BOD

As__________ Cu__________ Ni__________ Ti__________ Cl_2__________

Cd__________ Fe__________ Pb__________ Zn__________ NH_3-N__________

Cr__________ Mn__________ Se__________ Cl^-__________ PO_4-P__________

BACTERIA

Total Coliform____________________ Fecal Coliform____________________

COMMENTS & OTHER TESTS:____

____

____

COMPANY AND/OR LOCATION:____

DESCRIPTION (Include Possible Contaminants)____________________

____

____

Bottle No.:__________ Time Taken__________ Tit. (BOD)__________

Date Taken:__________ Date Set (BOD)__________ Time__________

Figure 4. Industrial monitoring record sheet.

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(8) Freas Low Temperature Incubator Model 815

(9) Perkin Elmer AA Model 403 with

- EDL Power Supply
- D_2 Background Correction
- Graphite Furnace

(10) G.K. Turner Spectrophotometer Model 350 with Square cuvette Accessory

(11) Wiley Mill

(12) Orion Specific Ion Electrodes

- Ammonia
- Nitrate
- Chloride

(13) Fume Hoods

- 1 4-ft perchloric acid hood
- 2 4-ft regular fume hoods with outside make up air

(14) Water Stills

- 1 Vaponics 10 gal/hr with RO Feed
- 1 Corning all glass 1 gal/hr for double distilled water

(15) Stainless steel lined glassware washer with distilled water rinse.

One of the most important items to the DWQ program listed above is the atomic absorption spectrophotometer. This unit is used to determine all of the heavy metal analyses performed by the division. With the AA equipment, metal analyses can be performed with minimum sample preparation and excellent reliability. Detection limits in many instances are at the parts per billion level. The gas chromatograph has been purchased to provide capabilities for planned monitoring of various organic compounds.

Enforcement Program

The director of the DWQ has the responsibility to enforce all provisions of the Industrial Water Pollution Control Ordinance. This responsibility and the necessary authority is defined in the ordinance, Chapter 6. The need for enforcement action implies that provisions of the ordinance have been or are presently being violated. There are basically three ways that the director can learn of an alleged or probable violation. They are:

(1) Notification of probable violation received from the violator;

(2) Laboratory results from sampling and/or inspections performed by the DWQ staff; and

(3) Notification of alleged violation received from a third party.

Normally, violations are identified through sampling and inspections performed by the DWQ staff. However, notification of accidental spills is normally received from the industry itself. Notification of violations from third parties does occur, but very infrequently.

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Before initiating any enforcement action, the Director must confirm that a violation has in fact occurred. He must also determine what type of violation has occurred, i.e., whether it is a violation of administrative requirements such as reporting, or a technical violation, e.g., discharge limitations.

If compliance is not achieved within the agreed-upon time schedule, the ordinance provides the director with several options. The director can

(1) Issue cease and desist orders

(2) Terminate services to the violator

(3) Petition the court for issuance of an injunction against the violator.

Reported Violations--

The normal procedure followed by the DWQ when notified of a possible violation (by either the discharger himself or a third party) is as follows:

(1) Discuss the details of the alleged violation with the party reporting the violation. Determine what happened, when and why it happened, the nature and duration of the violation. If notification is received from an industry, this information is obtained during an on-site discussion with a representative of the discharger.

(2) Determine if sufficient evidence is at hand to decide that a violation has occurred. If so, proceed with appropriate enforcement action. If not, determine additional data requirements, and schedule activities necessary to obtain the data. Use these data to determine if a violation has occurred.

(3) Determine the appropriate enforcement action after reviewing all pertinent data about the violation.

(4) Implement the enforcement action. This usually includes a compliance time schedule.

(5) Follow up to assure that compliance is achieved.

The staff of the DWQ believes that the success of the industrial discharge control program depends upon many factors. The manner in which the DWQ employees enforce the regulations may have the greatest influence of any factor on the continuing success and viability of the program. It demonstrates the sincerity and honesty of all parties involved.

For this reason, decisions regarding appropriate enforcement actions are made very carefully. The following factors are always considered when making a decision as to appropriate enforcement actions:

(1) Type of violation

(2) Frequency of violation

(3) Effects of the violation on the MSD system and receiving waters

(4) Past record of complying with ordinance and willingness to correct problems

(5) History of discharge quality.

A great deal of sound judgment is included in decisions to implement enforcement actions. They must be supported by factual information. To date, the DWQ has avoided the necessity of court action to enforce the ordinance.

Clean Water Council

In 1973, the DWQ and the industrial community in Muncie agreed to establish "The Muncie Industrial and Commercial Clean Water and Waste Management Council." This Council provides an effective communication mechanism between the DWQ and industry in Muncie.

The stated purposes of the Council are as follows:

(1) To relate industrial problems to the DWQ;

(2) To relate the DWQ goals, responsibilities and attitudes to industry;

(3) To work together for clean water;

(4) To work together for grants in the area of water pollution control;

(5) To keep informed on how the latest laws and regulations - local, state and federal - which affect the DWQ and industry in Muncie;

(6) To exchange technical information on

- Analytical testing procedures for water parameters
- Industrial techniques to abate water pollution
- Treatment technologies;

(7) To provide input into proposed local, state, or federal regulations;

(8) To work together on future problems and controls in the area of water pollution;

(9) To help Muncie with respect to industrial development, i.e., type of community and industrial involvement in community ecological affairs;

(10) To educate the public with respect to the role of industry in water pollution abatement; and

(11) To make sure that the water environment will be available for future generations to use and enjoy.

Members were designated as follows:

- Industrial and commercial establishments in the MSD
- The DWQ
- The Indiana State Board of Health (Industrial Waste Disposal Section)
- The Muncie and Delaware County Chambers of Commerce.

Meetings are held on a regular basis to discuss local water quality problems, new ordinances, and new state or Federal laws and regulations dealing with water problems. These meetings provide the forum for industry and government to relate to each other and discuss solving problems of mutual interest. The Council makes recommendations to the government on new regulations. An example of this was the input of the Council with respect to the EPA pretreatment guidelines proposed in February, 1977.

The Clean Water Council has now functioned for seven years. It has played an important role in improving communication between the DWQ staff, industry in Muncie, the Industrial Waste Disposal Section of Indiana State Board of Health (which is responsible for industrial pretreatment at the state level) and Region V, EPA.

The success of the Council lies in the fact that members have been able to discuss and take action on water quality problems facing Muncie, recognizing that their actions will have an effect on their own day-to-day activities. Through the Council, members can hear the viewpoints of others, providing a basis to work toward a mutual plan of action. The Council played a very active role in the development of the ordinances controlling industrial discharges to the MSD.

Industrial Surcharge Program

The DWQ is responsible for implementing the industrial surcharge provisions contained in Chapter 5 of the Industrial Water Pollution Control Ordinance. Briefly, the ordinance specifies that any user must pay a surcharge based on the amount of organic and solids loading in excess of normal domestic loadings. The loading is calculated using the flow and the difference between the concentration of pollutants in the discharge and 250 mg/l.

The applicable surcharge rates are shown on page 9, Appendix B. The surcharge program was initiated in May, 1973. Table 2 shows the surcharge revenue generated each year, the cumulative total, and the number of industries surcharged each year. The yearly revenues are also shown in graphical form in Figure 5. From 1973 through 1979, the surcharge revenues totaled $327,942. The average surcharge revenue for the MSD per year was $46,849.

5

TABLE 2. MUNCIE INDUSTRIAL SURCHARGE REVENUE

Year	Surcharge revenue ($)	Cumulative revenue ($)	Number of industries
1973	14,170	14,170	6
1974	37,952	52,122	6
1975	22,979	75,101	5
1976	48,197	123,298	8
1977	80,876	204,174	8
1978	50,846	255,020	10
1979	72,922	327,942	7

Average Surcharge Revenue/Year—$46,849

It is estimated that the added cost incurred by the DWQ in implementing the surcharge program is amount approximately one to two percent of the total annual DWQ budget. For 1978, the estimated cost of administering the surcharge program would be between $2,500 and $3,500. The surcharge revenue for that year was $50,846.

Industrial Case Histories

Since the formation of the DWQ in 1972, industries in the MSD have implemented a variety of approaches to cleaning up discharges or to preventing spills to the sewerage system or nearest stream. The fol-

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lowing case histories describe the approaches taken by four industries in Muncie to comply with the MSD regulations.

Case History 1--

In 1972, an existing lead acid battery plant had been discharging approximately 800 gallons per minute (gpm) of wastewater containing 20-25 mg/l of lead at a pH of 2 to 4. The company was evaluating the feasibility of continuing to operate this facility or build a new one. The DWQ staff was requiring this plant to reduce the discharge of lead to 2 mg/l. The plant management decided to build a new facility in Muncie, agreeing to construct a new pretreatment facility for lead removal with pH control. During the interim construction period for the new facility, the company proposed an interim pretreatment program to reduce lead in the discharge to the MSD treatment plant. Because this plant was an old facility, the 2 mg/l discharge limitation could not be reasonably achieved. The DWQ staff accepted the interim plan, recognizing the construction of a new pretreatment facility in the old plant was not reasonable. The interim pretreatment program provided for in house spill control, wherever possible, and chemical treatment and pH adjustment on selected waste streams. This program resulted in a 50 percent reduction in the lead discharged to the MSD system.

There were several positive results from this approach of local government and an industry working together. First, the industry remained in Muncie. Secondly, the lead levels in the MSD treatment plant sludge were reduced substantially, enhancing the viability of land application of the sludge. The company realized a savings in water costs. Most importantly, a working partnership was established between the DWQ staff and the industry, which has served to promote a cooperative approach to the solution of mutual problems.

Case History 2--

In 1972, an existing hard chrome plater was discharging wastewater containing 240 mg/l of chromium into a tributary of the White River. Faced with meeting the MSD water quality limitations, the company elected to invest $30,000 to construct a chromium reduction pretreatment facility and discharge to the MSD sewerage system. The pretreatment facility included pH adjustment, sulfur dioxide reduction of hexavalent chromium, filtration, and automatic monitoring. In addition, retaining walls were constructed around plating lines to prevent spills to the sewer. The practice of washing parts in an area where the drainage could enter a surface stream was stopped.

After operating the pretreatment facility for several years, the company decided to install a chromium reclamation system. This approach was taken to avoid a discharge and the costs associated with monitoring and operating a treatment plant.

Case History 3--

A metal stamping plant discharged oily wastes to the sanitary sewer. The concentration of oil in the discharge violated the MSD sewer use ordinance. The company installed a large underground storage tank to collect the oily wastes. The oil was then picked up by an outside oily waste treatment contractor. Storage areas were diked to prevent accidental spills from reaching storm water drains or sewer lines. In this case, the problem of oil discharge was solved using a simple approach requiring minimal capital investment.

Case History 4--

During monitoring of discharges to the MSD sewerage system, the DWQ staff identified a discharge of chromium from a local university. Chromium levels were similar to levels received from some electroplaters. The DWQ staff advised the university that the existing chromium levels violated the sewer use ordinance. Working with university utility personnel, the DWQ staff determined cooling tower water treatment chemicals to be the chromium source. At the request of the DWQ, the university evaluated alternatives to chromium for corrosion control. A non-chromium treatment alternative was proposed and accepted by the DWQ staff.

These four case histories demonstrate that there are often a variety of methods to achieve a desired reduction of various contaminants discharged to publicly owned treatment plants. They also point out the fact that, when establishing a pretreatment and water quality control program, the local control agency must look at all possible sources of undesirable pollutants and not just concentrate on manufacturing facilities.

WATER QUALITY MONITORING PROGRAM

The MSD was established to perform a variety of purposes which were discussed previously. One of these purposes was "to prevent the undue pollution of rivers, streams and water courses and other water" within its boundaries. To accomplish this goal, the MSD monitors the water quality of surface water resources in its boundaries to identify water pollution sources and trends or changes with time. Water quality data are necessary to determine the impact of efforts to eliminate pollution. Water quality monitoring is the second major element of the program of the DWQ.

Program Description

The MSD boundaries encompass nine bodies of water. The White River is the major river flowing through the District. It receives all runoff and direct discharges from the MSD treatment plant and other sources. Eight tributaries feed the White River. They are Buck Creek, Holt Ditch, Truitt Ditch, Greenfarm Ditch, Jakes Creek, Muncie Creek, 32 Ditch and Lennox Ditch. All of these water courses are included in the present DWQ water quality monitoring program.

Baseline Sampling Locations

The DWQ presently monitors 12 "city baseline" stations. The first four city baseline stations are located at bridges over the White River. Station 1 is 0.5 mile upstream of the Muncie Water Works intake. Sampling at this point defines the quality of the White River before it enters Muncie. Station 2 is approximately 3.5 miles from Station 1. Samples from Station 2 will show the effects of Truitt Ditch, 32 Ditch, Holt Ditch and Muncie Creek contributions, as well as urban runoff from Muncie and an industrial direct discharger. Station 3 is two miles downstream from Station 2. It is one mile upstream of the MSD plant outfall. Station 4 is one mile downstream from the plant outfall. It is also 10 miles from Station 1. The river at Station 4 has flowed entirely through Muncie. The remaining eight city baseline stations are located on various bridges on the eight tributaries of the White River.

In 1979, nine additional White River baseline stations were added to supplement the then existing four White River base stations. These stations allow the DWQ to monitor water quality changes over shorter segments of the river than was previously possible.

Each of the eight tributaries is monitored at five or six stations prior to its discharge into another stream. These represent a total of 45 sampling locations. The locations were selected on each tributary based on known discharge points along the stream to allow determinations of the impact these have on water quality. All stations are located at specified points and are never moved. All of the stations are at bridges. This allows samples to be taken regardless of weather or stream conditions and samples are always from the same place in the stream. Together, these stations represent 66 locations where water quality samples are obtained on a regular basis by the DWQ.

Water Quality Analyses

Samples are periodically obtained at each of the 66 stations (12 city baseline stations, nine additional White River baseline stations, and 45 tributary baseline stations). In determining the sampling frequency, the DWQ staff had to balance the desirability of a large data base with the resources available to the DWQ (staff, equipment, etc.).

Table 3 lists the analyses performed on each sample. Dissolved oxygen (D.O.) and temperature are always determined in the field. All test results are presently being coded for computer analysis and manipula-

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tion. The DWQ utilizes two in-house computer terminals with telephone hookup with the DEC 10 computer at Ball State University.

TABLE 3. ANALYSES PERFORMED ON BASELINE STATION SAMPLES

	Laboratory analyses		
Field analyses	**Chemical**		**Bacteriological**
Dissolved oxygen	pH	Chromium	Total Coliform
Temperature	TSS	Lead	Fecal Coliform
	BOD_5	Cadmium	Fecal Strep
	Cl	Nickel	
	Ammonia	Copper	
	NO_3-N	Zinc	
	Alk	Iron	
	PO_4-P	Manganese	

Uses of Water Quality Data

The results of the baseline station sampling and analysis effort are used by the DWQ for the following purposes:

(1) To determine the suitability of the White River and tributaries for recreational use and the propagation of aquatic life;

(2) To monitor the effects of waste discharges including urban runoff on water quality;

(3) To track adherence to or violation of applicable state and federal in-stream water quality standards;

(4) To determine patterns of pollution downstream from sources of pollution;

(5) To provide a source of field samples for Division research;

(6) To establish a baseline record of water quality for use in various studies, e.g., the 201 Facilities Plan; and

(7) To allow the DWQ to assess progress in improving water quality.

LABORATORY TESTING PROGRAM

The third major element of the program of the DWQ is water and wastewater testing. This includes testing performed for the MSD wastewater treatment plant and bacteriological testing of local swimming areas and drinking water supplies.

MSD Treatment Plant Testing

Daily influent, effluent, and sludge samples from the MSD wastewater treatment plant are delivered to the DWQ laboratory by plant personnel. Table 4 lists the various tests run on these samples by the DWQ. Tests are performed on both chlorinated and non-chlorinated effluent. Numerous other tests concerning op-

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erational parameters are conducted as required by the Indiana State Board of Health. Examples are various suspended solids tests, digester tests, etc.

TABLE 4. TREATMENT PLANT TESTING

Parameter	Influent	Both Cl_2 & Non Cl_2 Effluent	Sludge
BOD_5	X	X	
TSS	X	X	
D.O.	X	X	
pH	X	X	X
NH_3	X	X	
PO_4-P	X	X	
Cl	X	X	
NO_3N	X	X	
Oil & Grease	X	X	
Cr	X	X	X
Cu	X	X	X
Fe	x	X	X
Pb	X	X	X
Mn	X	X	X
Zn	X	X	X
Cd	X	X	X
Ni	X	X	X
Total Coliform	X	X	
Fecal Coliform	X	X	
Percent Solids			X

These data are used by the wastewater treatment plant as well as by the DWQ. The wastewater treatment plant utilizes these results for completing monthly NPDES monitoring reports and plant operation. These reports are signed by the superintendent of the treatment plant and the DWQ director and are submitted to the Indiana State Board of Health (the NPDES Authority).

Bacteriological Testing

The Bacteriological Section of the DWQ was certified by the Indiana State Board of Health in 1972 as a public health laboratory service. Certification allows the section to provide service for bacteriological examination of public waters for confirmed tests, standard plate count, the elevated temperature (EC) fecal coliform test, the elevated temperature (MF) fecal coliform count, direct (MF) fecal strep count and the completed test. Using these tests, the section can determine the suitability of water samples for potable purposes. Samples are brought to the laboratory by local residents and by the Delaware County Health Department when contamination is suspected. In all cases where drinking water is analyzed, results are sent to the Delaware County Health Department for determination of appropriate action. The DWQ cooperates with the County in this manner and believes this arrangement best serves the Muncie residents. In the summer months, the DWQ also performs testing of the swimming area at Prairie Creek Reservoir.

URBAN SEWER MONITORING PROGRAM

The Urban Sewer Study involves sampling sewers within the MSD which carry only domestic sewage.

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The purpose of the study is to determine the amount of heavy metals generated by normal households in Muncie.

Sources of metals in domestic wastewater include plumbing, natural levels in drinking water, and metals found in common household cleaning compounds and detergents. In addition, certain metals may enter a sewer system by infiltration of ground water and storm water.

Five locations are sampled each month. Grab samples are taken from manholes at each location. The samples are returned to the DWQ laboratory for analysis. Eight metals are run on each sample. They are chromium, lead, cadmium, nickel, copper, zinc, iron and manganese. Table 5 shows a summary of available data. All metals are total metal analyses. The minimum, maximums and average values are given. All concentrations are in mg/l. As the results in Table 6 indicate, normal domestic sewage in Muncie contains heavy metals.

TABLE 5. SUMMARY OF URBAN SEWER STUDY DATA

Station No.	Value	Cadmium	Chromium	Copper	Iron	Manganese	Nickel	Lead	Zinc
1 (Oaklyn at Normandy Sts.	Min	<.002	<.002	.027	.19	.018	<.007	<.02	.062
	Min	.057	.45	.62	3.6	.145	1.8	.42	.71
	Ave	<.005	<.03	.081	.84	.049	.04	<.04	.22
2 (Brook and Petty Sts.)	Min	<.002	<.002	.054	.17	.021	<.007	<.02	.047
	Max	.01	.35	.384	2.55	.119	.48	.1	.37
	Ave	<.004	<.02	.145	.63	.050	<.04	<.04	.131
3 (Lancaster and Sheffield Sts.)	Min	<.002	<.002	.053	.22	.02	<.007	<.02	<.03
	Max	.011	.142	.57	1.4	.13	.53	.11	.34
	Ave	<.004	<.02	.188	.53	.04	<.03	<.04	.14
4 (Elgin and Streeter Sts.)	Min	<.002	<.002	.022	.28	.019	<.007	<.02	.064
	Max	.025	.25	.88	24.	.54	.16	.22	2.5
	Ave	<.005	<.02	.10	1.3	.11	<.02	<.05	.29
5 (21st and Macedonia Sts.)	Min	<.002	.002	.023	.28	.026	<.007	<.22	.04
	Max	.028	.60	1.1	29.	.136	1.16	.53	.69
	Ave	<.005	.02	.10	1.1	.06	<.05	<.05	.24

*All values reported as mg/l.

In 1973, the DWQ calculated the following percentages of metal loadings to the wastewater treatment plant were from non-industrial sources.

These values were before industrial pretreatment and control was implemented. Obviously, there is a considerable metals loading on the plant from non-industrial sources. Since control of these sources is difficult, if not impossible, these data must be recognized in any approach to regulating industrial contributions, which are more amenable to control.

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TABLE 6. PERCENTAGE OF METALS FROM NON-INDUSTRIAL SOURCES

Metal (mg/l)	Percent
Cr	2.3
Cu	33
Fe	49
Mn	25
Ni	11.5
Zn	15
Pb	8.6

PARKING LOT RUNOFF MONITORING PROGRAM

The second special study being conducted by the DWQ involves monitoring the quality of storm runoff from various major parking areas in Muncie. The objective of this effort is to assess the impact of urban runoff on the water quality in the White River. Runoff from rainfall or snow melt is monitored at five major parking areas. Each lot was selected based on its accessibility and having a single isolated discharge point which does not carry sewage or industrial wastes. Samples are generally taken after an extended period of no runoff and, when possible, are collected during the initial runoff period. This assures that the worst case conditions will be monitored. Results of metal analyses are shown in Table 7 for each parking lot. Averages are of results obtained for seven separate sampling periods. Analyses are for total metals. All concentrations are in mg/l.

TABLE 7. SUMMARY OF PARKING LOT RUNOFF DATA*

Station No.	Value	Cadmium	Chromium	Copper	Iron	Manganese	Nickel	Lead	Zinc
K-Mart North (Formerly Mason's Dept. Store)	Min	<.002	.005	.006	<.002	.005	<.01	.01	.022
	Max	.006	.084	.150	18.2	1.1	2.6	6.3	1.5
	Ave	<.009	.030	.031	<1.4	.135	<.205	1.0	.246
Meadow's Shopping Center	Min	<.002	.009	.01	<.012	.037	<.01	.02	.074
	Max	.41	.134	.1	33.4	.86	3.9	7.0	2.1
	Ave	<.030	.044	.063	6.1	.206	.30	1.6	<.55
Muncie Mall	Min	<.002	.008	.014	<.022	.024	<.008	.01	.073
	Max	.042	.137	.157	52.	.72	1.2	2.4	1.2
	Ave	<.006	.031	.043	5.95	.140	.10	.52	<.36
Tillotson Ave. Bridge	Min	<.002	.004	.013	<.002	.028	≤.007	.01	.087
	Max	.10	.139	.246	54.	1.36	5.0	14.0	2.6
	Ave	<.015	.042	.068	13.2	.35	.284	2.16	.64
Val Dept. Store	Min	<.002	<.002	.008	<.002	.014	≤.007	.01	≤.007
	Max	.02	.113	.107	18.2	.41	5.0	7.2	1.9
	Ave	<.005	.030	.044	3.7	.13	.04	1.19	.50

*All values reported as mg/l.

RESEARCH PROJECTS

The DWQ conducts in-house research projects in areas of direct concern to the MSD. Three research programs initiated by the DWQ are the Crop Uptake Program and the Priority Pollutant Study. Each of these programs is described in the following sections.

Crop Uptake Study

The DWQ began heavy metals analysis of the sludge generated by the MSD treatment plant in 1972. After one year of analysis, and in recognition that all sludge was being applied to farm land, the DWQ believed that a crop uptake study was necessary. The research program subsequently developed was intended to answer the basic question of whether sludge application to farm land would contaminate the soil and crops grown on that soil. The results would then be used to direct future sludge disposal programs.

A cooperative agreement was initiated with the Purdue University School of Agronomy in October, 1973. The agreement specifies that the MSD delivers digested sludge to Herbert Davis Agricultural Center of Purdue near Parker, Indiana, where the research is being conducted. Purdue personnel performs soils analysis for nutrient value and determines crop yields. The DWQ personnel performs the heavy metals analyses on soils and crop yields.

Corn and soybeans, the two most important crops of Indiana, were selected for study. The research team has planted 20 plots in corn and 20 plots in soybeans. Each plot is 1500 square feet. Four sludge applications rates, as well as control plots, were used on groups of four plots each. Initially soil samples were taken before sludge application, after plow down in the fall, just before planting in the spring, and after harvesting. In subsequent years, soil samples were taken in the fall before sludge application. The crops were sampled periodically to detect uptake of metals into the foliage or grain. Metals to be monitored include copper, chromium, nickel, zinc, iron, lead, cadmium, and manganese. This study is presently ongoing. Final results and conclusions are not yet available.

Fish and Macroinvertebrates Studies

In the area of water pollution control, much emphasis in the past has been the detection of water pollution through chemical analysis. One of the problems of monitoring water quality through chemical tests is the limited number of chemicals or compounds which can be economically tested. Also, while there are standard chemical tests which indicate levels of pollution in a general sense, there is the very real possibility of missing the regular or sporadic presence of a biologically toxic substance. By monitoring the biological communities found within an aquatic system, this type of problem can be detected and a solution can be sought. The thousands of creatures living in the aquatic system come in direct contact with those chemicals which may have been present at any one time within the water. Biological monitoring of water pollution is theoretically comparable to a continuous 24-hour, 365-day per year sampling program of chemical parameters.

Populations of two groups of aquatic organisms, fish and benthic macroinvertebrates, are being monitored by the DWQ. Fish, an important recreational and food resource, are familiar organisms to most people. Benthic macroinvertebrates (animals which can be seen with the naked eye and have no backbone) are often overlooked by the public but are receiving attention from environmental scientists for their value as indicators of water quality. In the monitoring program, populations of fish and benthic macroinvertebrates are sampled periodically and the species and numbers collected are recorded. Anomalous changes in the population structures of these organisms are indicative of changes in water chemistry and provide the DWQ with a fairly reliable tool for assessing changes in water quality. A phycological study is being established at the present time and will begin in 1980.

The benthic samples are being obtained and analyzed at 30 stations covering 100 miles of the West Fork of the White River and its tributaries. The objective of the program is to establish a macro-invertebrate baseline. Baseline is defined as periodic estimations of base station benthic community structure along with a continuing faunal survey. It is hoped that this work will lead to the recognition of a correlation between the presence or absence of particular species and water quality. The DWQ personnel are striving to develop taxonomic keys for adult and larval macroinvertebrates so that the species can be properly identified. They are also developing appropriate methods to sample these organisms.

Phycological studies are being initiated at the DWQ, due to the potential for added monitoring sensitivity. Photosynthetic organisms provide the underlying support for any given aquatic ecosystem. Perturbations in the composition and quality of the biota encountered at this level are thus reflected at higher levels. Plans for the immediate future include qualitative and quantitative assessment of indigenous phytoplankton, periphyton and macrophyte populations. This information will be used in conjunction with bioassay techniques and biomass/production estimates to develop an appropriate monitoring program.

It is hoped that such a program will result in concise and pragmatic techniques directed toward biological indices for assessing water quality and water quality management at the local level. Studies to examine the effects of attached and rooted flora in such phenomena as nutrient, stripping and bio-accumulation of toxic substances (e.g., heavy metals) are also being considered.

The fish study involves the examination of metal concentrations in fish tissues taken at three stations on the White River. The DWQ hopes to be able to determine ambient levels of selected heavy metals in the tissue.

This study was initiated in 1972. Fish were collected by bag seine and electro seine at each station. Fish were then individually wrapped in plastic freezer bags after identification and were iced. They were taken to the laboratory for measurement and subsequent freezing until analysis could begin. Samples were prepared by drying the tissue and subsequent grinding in a mortar and pestle. Three digestion methods were used initially; however, a wet digestion technique using 150 ml beakers is presently being used for all tissue.

Data will be used as an indicator of water quality.

Priority Pollutant Study

Sampling Program--

A priority pollutant sampling and analysis program was initiated by the DWQ in June, 1980. The objectives of this study were as follows:

(1) Determine the presence and concentrations of priority pollutants of various stages of the MSD wastewater treatment system,

(2) Determine the contribution of priority pollutants from major industrial dischargers to the MSD system; and

(3) Assess the impact of the treatment plant on concentration levels of priority pollutants.

To accomplish these objectives, 24-hour composite samples were taken at various locations at the MSD treatment plant and selected industries within the MSD. The MSD plant sampling stations are shown in Table 8. The industrial sampling stations are shown in Table 9. Two urban sewer stations were included to determine the presence of priority pollutants in domestic sewage. Figure 6 is a flow diagram of the MSD treatment plant showing the location of the sixteen sampling stations. The sampling and analysis procedures utilized during this study were those recommended in "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants", U.S. EPA Environmental Monitoring and Support Laboratory, Revised April 1977.

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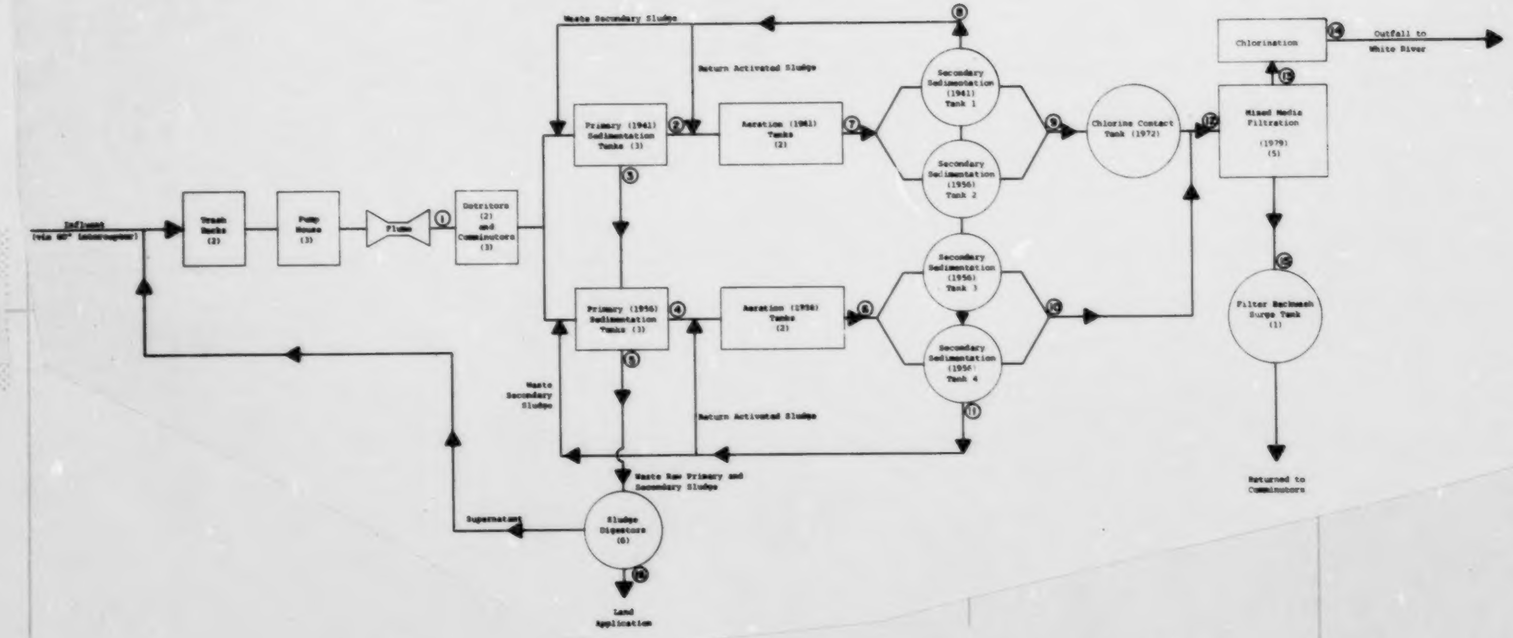
Influent
(via 60" Interceptor)
Trash Racks (2)
Pump House (3)
Flume
①
Detritors (2) and Comminutors (3)
Primary (1941) Sedimentation Tanks (3)
②
③
Primary (1956) Sedimentation Tanks (3)
④
⑤
Waste Secondary Sludge
Return Activated Sludge
Aeration (1941) Tanks (2)
Aeration (1956) Tanks (2)
⑦
⑥
Secondary Sedimentation (1941) Tank 1
Secondary Sedimentation (1956) Tank 2
Secondary Sedimentation (1956) Tank 3
Secondary Sedimentation (1956) Tank 4
⑧
⑨
⑩
⑪
Chlorine Contact Tank (1972)
⑫
Mixed Media Filtration (1979) (5)
⑬
Chlorination
⑭
Outfall to White River
⑮
Filter Backwash Surge Tank (1)
Returned to Comminutors
Waste Secondary Sludge
Return Activated Sludge
Waste Raw Primary and Secondary Sludge
Sludge Digestors (6)
⑯
Land Application
Supernatant

Figure 6. Priority pollutant sampling stations at the MSD treatment plant.

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TABLE 8. MSD PRIORITY POLLUTANT POTW SAMPLING STATIONS

Station No.	Description
1	Influent
2	Effluent—old (1941) primary clarifiers 1-3
3	Sludge—old (1941) primary clarifiers 1-3
4	Effluent—new (1956) primary clarifiers 4-6
5	Sludge—new (1956) primary clarifiers 4-6
6	MLSS—new (1956) aeration tanks
7	MLSS—old (1941) aeration tanks
8	Return activated sludge—old (1941) secondary clarifiers
9	Effluent—secondary clarifiers 1-2
10	Effluent—secondary clarifiers 3-4
11	Return activated sludge—new (1956) secondary clarifiers
12	Influent to multi-media filters
13	Filter effluent before chlorination
14	Filter effluent after chlorination (final effluent)
15	Filter backwash
16	Digestor sludge

TABLE 9. MSD PRIORITY POLLUTANT INDUSTRIAL SAMPLING STATIONS[a]

Station No.	SIC No,	Descriptions
17	8061	Hospital
18	3461	Metal Stampings
19	4941	Water Supply
20	3321	Gray Iron foundries
21	3612	Transformers
22	3714	Motor vehicle parts
23	3471	Electroplating
24	—	Urban sewer
25	2086	Bottled and canned soft drinks
26	3325	Steel foundries
27	3312	Blast furnaces
28	2099	Food preparations
29	7213	Linen supply
30	3542	Machine tools
31	2086	Bottled and canned soft drinks
32	7213	Linen supply
33	3471	Electroplating
34	3079	Plastic products
35	—	Urban sewer

[a] Includes two urban sewer samples representative of domestic sewage only.

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Analytical Results--

The results of the laboratory analyses are presented in Tables 10-17. Only those priority pollutants detected at trace concentrations or higher are included in these tables. Priority pollutants analyzed for but not detected are presented in Table 18. It should be noted that the station numbers shown in Tables 10-13 have been arranged to allow easier comparison of the results from similar unit operations at the treatment plant. For example, stations 2 and 4 both represent primary clarifier effluent, and stations 3 and 5 represent primary clarifier waste sludge.

Table 10 indicates metal concentrations generally increased from the influent through primary clarification and activated sludge aeration. Secondary clarifier effluent concentrations were considerably below influent values, commonly an order of magnitude lower. The exception was nickel. The results for station 16 (digested sludge) are very similiar to results from stations 3 and 5 (primary sludge). This was anticipated, since a representative sample of digested sludge could not be obtained on the day samples were taken. Therefore, the results for station 16 should not be considered representative of typical digested sludge.

TABLE 10. PRIORITY POLLUTANT HEAVY METAL CONCENTRATIONS FOR STATIONS 1-16

Station No.	Ag	As	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Zn
1	.0119	.0016	<.0001	.0004	.0298	.062	<.0003	.0134	.427	<.0085	1.60
2	.0550	.026	.0018	.0052	.505	.680	<.0003	.1682	.759	<.0085	2.43
4	.0368	.028	.0011	.0038	.335	.450	.0023	.0952	.430	<.0085	1.57
3	.7275	.188	.0473	.1669	9.03	20.6	.0066	4.50	31.0	.0288	79.5
5	.690	.866	.0378	.1563	7.73	17.0	.0053	5.04	14.5	.0238	48.0
6	.0931	.051	.0026	.0082	.760	1.08	<.0008	.2523	1.08	<.0085	2.445
7	.0260	.2210	.0077	.0733	1.76	3.21	.0014	.6141	2.95	<.0087	12.3
8	.222	.608	.0250	.0897	5.19	11.7	.0038	2.46	8.38	.0151	38.9
11	.0439	.443	.0145	.0540	3.110	6.39	.0023	1.798	5.06	<.0162	22.3
9	.0002	.0007	<.0001	<.0001	.0167	.0017	<.0003	.0192	.002	<.0085	.027
10	.0002	.0010	<.0001	<.0002	.0006	.0006	<.0003	.0090	.001	<.0085	.025
12	.0004	.0010	<.0001	.0001	.0030	.0028	<.0003	.0119	.003	<.0085	.028
13	.0003	.0011	<.0001	.0001	.0023	.0037	<.0003	.0091	.003	<.0085	.035
15	.0022	.0013	<.0001	.0001	.0069	.016	<.0003	.0127	.013	<.0085	.077
16	.429	1.29	.0436	.1963	10.4	28.7	.0034	4.04	19.0	.0310	84.5

Sixteen volatile organics were detected at various stages in the treatment plant, as shown in Table 11. Only nine of these were detected in the influent. Trans-1,1-dichloroethylene was the only organic undetected in the influent and detected at subsequent stations at concentrations above 10 μg/l. Toluene was detected at high concentrations in the primary and secondary sludge samples.

Nineteen base/neutral extractables were detected of the treatment plant. These results are shown in Table 12. The concentrations of most of these compounds were less than 10 μg/l. Six acid extractables were detected at very low concentrations, as shown in Table 13.

The heavy metal concentrations for the industrial sampling stations are presented in Table 14. Thallium was not detected at any of these stations. The two urban sewer stations, 24 and 35, contained copper, nickel, lead and zinc at concentrations significantly above the detection levels.

Fourteen of the 32 priority pollutant purgeable organics were found in the industrial samples. The results are shown in Table 15.

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The presence of methylene chloride and chloroform at relatively high concentraions may have been caused by a high chlorine residual in the municipal water supply. The concentration of the base/neutral extractables and acid extractables presented in Tables 16 and 17, respectively, are generally less than 10 μg/l.

FISH KILL INVESTIGATIONS

The DWQ performs fish kill investigations when they occur in the Muncie area. The area covered includes 90 miles of streams within the MSD jurisdictional area. DWQ staff biologists are used to investigate kill. Since 1972, eight investigations have been conducted. Reports are filed with the Indiana State Board of Health, the Department of Natural Resources and the U.S. EPA regional office. The report includes information concerning the approximate number of fish lost, and the cause and source of the kill.

SPILL RESPONSE

The DWQ is responsible for the cleanup of oil or chemical spills within the MSD jurisdictional area or in the White River watershed upstream of Muncie. The staff is on call 24 hours per day to respond. Spill containment and cleanup equipment is available for DWQ use. Equipment includes booms, straw dams, pumps, and a trailerable boat. Normally, local contractors are hired to assist in major cleanup efforts.

TABLE 11. PRIORITY POLLUTANT VOLATILE ORGANIC CONCENTRATIONS FOR STATIONS 1-16 (μg/l)

Station No.	Methylene chloride	Trichlorofluormethane	1,1-dichloroethylene	1,1-dichlorethane	Trans-1,2-dichloroethylene	Chloroform (high Cl_2 in water)	1,2-dichloroethane	1,1,1-trichloroethane	Bromodichloromethane	Trichloroethylene	Dibromochloromethane	Benzene	Bromoform	Tetrachloroethylene	Toluene	Ethylbenzene
1	7		5			17		4		11		1		4	4	2
2				2	6	2		11						3	12	2
4	3	*			3	7								3	10	2
3	50				24							7		2	17400	
5	54				11	3				7		8			15500	28
6					*	1								*	3	
7						1				1				1	22	
8	22				2	1						2		2	750	
11	29				2	3						2		*	1240	
9						4			*		*					
10	5								*	1				*		
12					5				*	1						
13	3					5			1					*		
14						10			5		3		1			
15						5			2							
16	*											*			347	5

*<1 μg/l (trace).
Blank spaces indicate not detected.

TABLE 12. PRIORITY POLLUTANT BASE NEUTRAL EXTRACTABLE CONCENTRATIONS FOR STATIONS 1-16 (μg/l)

Station No.	1,2-Dichlorobenzene	Naphthalene	Isophorone	1,2-Diphenylhydrazine	Phenanthrene/ Anthracene	Fluorene	Fluoranthene	Pyrene	Dimethylphthalate	Diethylphthalate	Di-n-butylphthalate	Butylbenzylphthalate	Bis(2-ethylhexyl) phthalate	N-octylphthalate	Chrysene/ Benzo(a) anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Indeno(1,2,3-c,d)pyrene	Benzo(b)fluoranthene/ Benzo(k)fluoranthene
1	*	1	1		4	*	*	1	*	2	9	6	20	1	3	*			*
2	2	1	2		2		1	2	*	1	*	1	5		4				
4	1	*		1	6		*	2	5	1	21	8	11	5					
3	4	2			10		7	11		I	I	19	I	29	17	8	2	3	7
5	3	2			4		1	7			*	5	188	12	9	4	1	2	3
6	1	*			3		*	*			9	4	3						
7	*	*	*				*	1		*	1	1	I		2				*
8	6				13		13	21		*	I	I	I		39		9	11	19
11	1	*			6		3	5	18	I	I	I	I	I	7		*	*	2
9	*				4			*			18	2	I	*					
10												*							
12	*								*		5	5	2	*					
13	*										14	2	*						
14	*			2					*		7	3	7						
15	*			*					*		16	2	11						
16	5	8			5	1	12	17		8	1	8	I	*	24	7	2	3	8

*Trace (<1 μg/l).
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TABLE 13. PRIORITY POLLUTANT ACID EXTRACTABLE CONCENTRATIONS FOR STATIONS 1-16 (μg/l)

Station No.	2-Chlorophenol	Phenol	2,4-Dichlorophenol	2,4,6-Trichlorophenol	4-Chloro-m-cresol	Pentachlorophenol
1			*			4
2						
4				*	1	2
3		9				
5		14				
6						
7						
8						
11		*				
9						*
10						
12						1
13						*
14						
15				*	*	1
16	7		1	3	4	

*Trace (<1 μg/l).
Blank spaces indicate not detected.

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TABLE 14. PRIORITY POLLUTANT HEAVY METAL CONCENTRATIONS FOR STATIONS 17-35 (mg/l)

Station No.	Ag	As	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Zn
17	0.0660	0.009	0.070	0.0017	0.294	.310	0.0005	<0.002	0.025	<0.011	<0.003	0.88
18	0.0012	0.004	<0.001	0.0007	0.070	0.139	<0.0003	0.077	0.078	<0.011	<0.003	0.32
19	.0011	0.600	<0.001	1.0039	0.784	0.450	<0.0003	0.342	3.256	<0.011	0.0004	1.73
20	0.0410	0.120	0.046	0.1190	0.334	0.689	<0.0003	0.061	8.95	0.200	0.022	10.6
21	0.0034	0.004	<0.001	0.0008	<0.005	0.076	<0.0003	0.007	0.005	<0.011	0.003	1.89
22	<0.0002	0.004	<0.001	0.0007	0.010	0.081	<0.0003	0.173	0.014	<0.011	0.003	0.75
23	0.0810	0.017	0.035	0.0990	0.406	40.6	<0.0003	6.48	0.037	<0.011	<0.003	0.90
24	0.0004	<0.003	<0.001	0.0003	<0.005	0.362	<0.0003	0.010	0.004	<0.011	0.003	0.09
25	0.0002	<0.003	<0.001	0.0129	0.036	0.119	<0.0003	0.036	0.101	<0.011	<0.003	0.37
26	0.0002	0.003	<0.001	0.0018	<0.005	<0.016	<0.0003	0.017	0.010	<0.011	0.003	0.11
27	<0.0002	<0.003	<0.001	0.0017	<0.005	0.0280	0.0008	0.015	0.006	<0.011	0.003	4.75
28	<0.0002	<0.003	<0.001	0.0013	<0.005	0.073	0.0008	0.011	0.010	<0.011	<0.003	0.21
29	0.0012	0.008	<0.001	0.0035	<0.005	0.421	0.0008	0.028	0.058	0.079	<0.003	1.05
30	<0.0002	<0.003	<0.001	0.0027	17.2	0.266	0.0003	0.017	0.316	<0.011	0.003	0.15
31	<0.0002	<0.003	<0.001	<0.0002	<0.005	<0.016	0.0010	0.006	<0.001	<0.011	<0.003	0.04
32	0.0200	0.009	<0.001	0.0243	0.122	0.470	<0.0003	0.121	0.816	0.019	0.008	5.18
33	0.0018	0.008	<0.001	0.0029	5.12	0.261	0.0004	0.045	0.335	<0.011	<0.003	48.6
34	0.0010	<0.003	<0.001	<0.0002	<0.005	0.060	0.0007	0.007	0.019	<0.011	0.003	0.46
35	0.0004	<0.003	<0.001	0.0015	0.005	0.032	<0.0003	0.010	0.003	<0.011	<0.003	0.26

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TABLE 15. PRIORITY POLLUTANT VOLATILE ORGANIC CONCENTRATIONS FOR STATIONS 17-35 (μg/l)

Station No.	Methylene chloride	1,1-dichloroethane	Trans-1,2-dichloroethylene	Chloroform (high Cl_2 in water)	1,2-dichloroethane	1,1,1-trichloroethane	Carbon tetrachloride	Bromodichloromethane	Tirchloroethylene	Dibromochloromethane	Benzene	Tetrachloroethylene	Toluene	Chlorobenzene
17	6			42				6						53
18														
19	3			1050			1	64		3				
20				*										
21				22				1						
22		2	3	41						*				
23	24			*	1				*			88		
24	26		*	56	1	3			*			*	1	
25	18			123	*		*	6		*				
26	110			1690	7	150	1	160		12	12		8	
27	54			87	*	6	1	7		*				
28	10			250	1		2	4		2				
29				98				2				3		
30	10			700	*	*	*	16		*		*		
31		1		480	12	*	1	16		1				
32			*	62	1	2	1	2	*					
33	30			95	*			10		*		*		
34	60		*	38	*	3		7	1	2		*		
35	20			30	*		*				*			

*<1 μg/l (trace).
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TABLE 16. PRIORITY POLLUTANT BASE NEUTRAL EXTRACTABLE CONCENTRATIONS FOR STATIONS 17-35 (μg/l)

Station No.	Naphthalene	Isophorone	Phenanthrene/Anthracene	Fluorene	Fluoranthene	Pyrene	Dimethylphthalate	Diethylphthalate	Di-n-butylphthalate	Butylbenzylphthalate	Bis(2-ethylhexyl)phthalate	Chrysene/Benzo(a)anthracene	3,3'Benzidine
17							*	1		2	5		
18					3	*	*	1	*	*	*		
19	3		5	*	1	*		*		2	11	*	6
20				*					*	2			
21									3	3			
22			2			*		*	1	*			
23									2	19	*		
24							*	8	*	2	2		
25			*							1	*		
26								*					
27							*	*					
28						*				*			
29	1						*	6	4	4	12		
30													
31											*		
32	159		41		5				11	19			
33											1		
34								*	*	*	*		
35					*		*	6		*	1		

*Trace (<1 μg/l).
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TABLE 17. PRIORITY POLLUTANT ACID EXTRACTABLE CONCENTRATIONS FOR STATIONS 17-35 (μg/l)

Station No.	2-Chlorophenol	Phenol	2,4-Dimethylphenol	2,4-Dichlorophenol	2,4,6-Trichlorophenol	4,6-Dinitro-o-cresol	Pentachlorophenol
17				5	2		
18							
19							
20		77					1
21							
22		3					
23							
24							
25					3		
26		3	1	*	2		
27	*			*			
28							
29							
30							
31							
32		*				12	
33							1
34							
35				*	*		*

*Trace (<1 μg/l).

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TABLE 18. PRIORITY POLLUTANTS NOT IDENTIFIED IN MSD POTW OR INDUSTRIAL SAMPLES

Metals	Purgeable organics	Base/neutral extractables	Acid extractables	Pesticides/ PCB's
Selenium	Acrolein	Hexachloroethane	2-Nitrophenol	α-Endosulfan
Thallium	Acrylonitrile	Hexachlorobutadiene	4-Nitrophenol	β-Endosulfan
	1,1,2-Trichloroethane	Hexachlorobenzene	2,4-Dinitrophenol	Endosulfan sulfate
	1,1,2,2-Tetrachloroethane	bis(2-Chloroethoxy)methane		α-BHC
	Chloroethane	2-Chloronaphthalene		β-BHC
	2-Chloroethyl vinyl ether	Nitrobenzene		δ-BHC
	1,2-Dichloropropane	2,4-Dinitrotoluene		γ-BHC
	1,3-Dichloropropane	2,6-Dinitrotoluene		Aldrin
	Methyl chloride	4-Bromophenyl phenyl ether		Dieldrin
	Methyl bromide	Dibenzo(a,h)-anthracene		4,4'-DDE
	Dichlorobromomethane	4-Chlorophenyl phenyl ether		4,4'-DDD
	Dichlorodifluoromethane	Benzidine		4,4'-DDT
		bis(2-Chloroethyl)ether		Endrin
		Hexachlerocyclopentadiene		Endrin aldehyde
		N-Nitrosodiphenylamine		Heptachlor
		Acenaphthylene		Heptachlor epoxide
		Acenaphthene		Chlordane
		N-Nitrosodimethylamine		Toxaphene
		N-Nitrosodi-n-propylamine		Aroclor 1016
		bix(2-Chlorosiopropyl)ether		
				Aroclor 1221
				Aroclor 1232
				Aroclor 1242
				Aroclor 1248
				Aroclor 1254
				Aroclor 1260
				2,3,7,8-Tetrachlorodibenzo-π-dioxin (TCDD)

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SECTION 5

DIVISION OF WATER QUALITY ADMINISTRATION

MANAGEMENT

The authority for implementation of all DWQ programs is shared by a director and assistant director. The director reports to the MSD Board of Commissioners. He has knowledge of all areas for which the DWQ has responsibility. He makes decisions concerning all DWQ activities. The director has firsthand familiarity with the MSD sewerage systems and wastewater treatment plant, the industrial contributors to the system, the water resources within the MSD jurisdictional boundaries, and the required support capabilities such as the chemistry and bacteria laboratories. This background is important in implementing city ordinances and hiring competent staff. It helps to ensure the long term success and viability of the DWQ, particularly with regard to the pretreatment program. Credibility with the industrial sector of Muncie has been established and must be maintained to assure the long term success and viability of the DWQ program.

The assistant director of the DWQ administers many day-to-day activities within the DWQ. He also shares in the director's responsibilities. He works with the three technical sections to assure that the various program requirements are accomplished. The director and assistant director participate in all activities of the DWQ. Examples are:

(1) Establish and implement basic DWQ policy;

(2) Manage the DWQ budgetary requirements;

(3) Serve as liaison between the DWQ, other MSD divisions, the public, and all other local, state and federal agencies;

(4) Administer DWQ personnel matters;

(5) Coordinate the field sampling program;

(6) Assure that the required chemical and bacteriological analyses are performed on time;

(7) Purchase all laboratory and field supplies for the DWQ; and

(8) Evaluate all industrial analytical results to determine compliance with existing ordinances.

A full time secretary provides administrative support for the DWQ.

The Bacteriological Section is staffed with two experienced degreed bacteriologists. The laboratory is certified by the Indiana State Board of Health. They perform all bacteriological work for the DWQ and the wastewater treatment plant. The majority of work involves determination of total and fecal coliform levels in samples collected from the current 66 baseline stations. This effort requires the completion of over 100 tests each week. Samples are delivered to the laboratory by the Industrial and Stream Surveillance Section. This section also performs all bacteriological testing on samples taken from the MSD treatment plant.

The Chemistry Section is staffed by five full-time employees having BS degrees. Samples are delivered by the Industrial and Stream Surveillance Section. Each staff member is responsible for specific types of analyses. For example, sample preparation for AA analysis is assigned to a specific individual. All results are reviewed by the chief chemist or assistant chemist prior to being recorded in appropriate log books. Data are typed, reviewed by the chemistry and field section staff, then logged.

The Industrial and Stream Surveillance Section is staffed with two full-time biologists. The section is responsible for collecting all samples required by the DWQ industrial monitoring, surcharge, and baseline water quality programs. Section personnel are responsible for maintaining sampling equipment, planning sampling efforts, and delivering properly collected samples to the Chemistry or Bacteriological Sections for analysis.

The Biological Surveillance Section is staffed with two full-time biologists. This section is responsible for implementation of sampling requirements of the fish, benthic, and phycological studies. They are also responsible for analysis of samples and data analysis and presentation. They assist the Industrial and Stream Surveillance Section during weekend sampling.

DWQ job descriptions are contained in Appendix C. Appendix D contains standard forms utilized by the DWQ for various programs.

BUDGET

As one of the five operating departments of the MSD, the DWQ receives approval of its operating budget each fiscal year. A breakdown of the 1980 fiscal year budget for the DWQ is shown in Table 19. Operating expenses include payroll, laboratory supplies, equipment maintenance and fuel for field vehicles. Special major purchases such as a new field van or a gas chromatograph are budgeted separately. Indirect overhead costs are paid directly by the MSD and are not reflected in Table 19.

TABLE 19. 1980 DWQ OPERATING BUDGET

Operating Income	
Operating Expenses	
Salaries and Wages	$203,000
Benefits	38,385
Social Security	12,444
Materials and Supplies	25,000
Phone and Office Supplies	3,400
Travel	3,500
Total Operating Expenses	$285,729

Approximately one-third of the budget ($95,243) is chargeable to the industrial monitoring and surcharge program. This would cover salaries for one administrator, two chemists, a field person and a secretary as well as the maintenance and operation of field and laboratory equipment necessary to monitor the industrial dischargers. This equates to a cost of approximately 87 cents per person served by the MSD to implement the industrial discharge control and monitoring program.

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SECTION 6

INDUSTRIAL DISCHARGE CONTROL PROGRAM IMPACT ON METALS

INFLUENT AND EFFLUENT METAL CONCENTRATIONS

The concentration of heavy metals in the influent and effluent at the MSD wastewater treatment plant have generally decreased since 1972. Table 20 shows the 1972-1979 average concentrations for seven heavy metals in the raw influent and final effluent at the MSD wastewater treatment plant. The data are presented in graphical form in Figure 7.

TABLE 20. DAILY AVERAGE METAL CONCENTRATIONS AT THE MSD TREATMENT PLANT (in mg/l)

Year		Cr	Cu	Fe	Mn	Ni	Zn	Pb
1972	Raw	.27	.25	2.85	.09	.12	.79	.92
	Final	.06	.08	.55	.08	.12	.24	.17
1973	Raw	.24	.26	2.3	.14	.14	1.15	.93
	Final	.04	.06	.5	.09	.04	.27	.27
1974	Raw	.14	.19	2.13	.20	.11	.58	.81
	Final	.04	.06	.83	.17	.09	.21	.33
1975	Raw	.11	.11	2.4	.23	.08	.42	.57
	Final	.04	.04	.56	.15	.05	.10	.06
1976	Raw	.089	.11	4.3	.228	.042	.647	.53
	Final	.008	.02	.42	.129	.029	.107	.05
1977	Raw	.087	.079	3.13	.254	⩽.04	.53	.35
	Final	0.21	.014	.55	.149	⩽.02	.15	.06
1978	Raw	.077	.178	2.77	.160	.03	.367	.10
	Final	.027	.064	.83	.127	<.03	.139	.06
1979	Raw	.075	.188	3.22	.198	.03	.40	.10
	Final	<.004	.179	.43	.102	⩽.02	.056	<.03

These data provide a means to assess the impact of compliance by industry with the industrial sewer use ordinance discharge limitations. For example, Figure 7 shows nearly a 90 percent reduction in influent lead concentrations between 1972 and 1979. The first significant decrease came in 1975. During 1975, a large lead-acid battery manufacturer in Muncie began implementing control measures until a new manufacturing facility and pretreatment system began operation. In 1978, the new facility began operation. The result has

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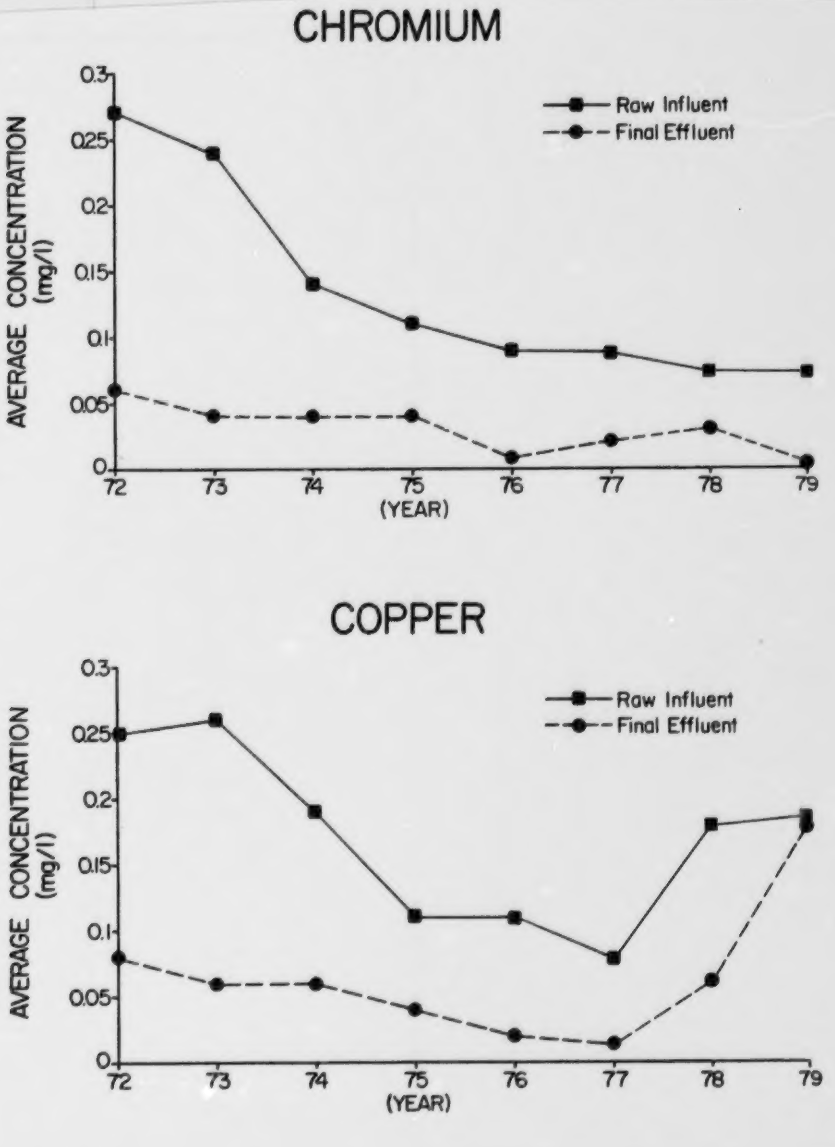

Figure 7. Daily average metal concentrations in the MSD treatment plant influent and effluent from 1972 through 1979.

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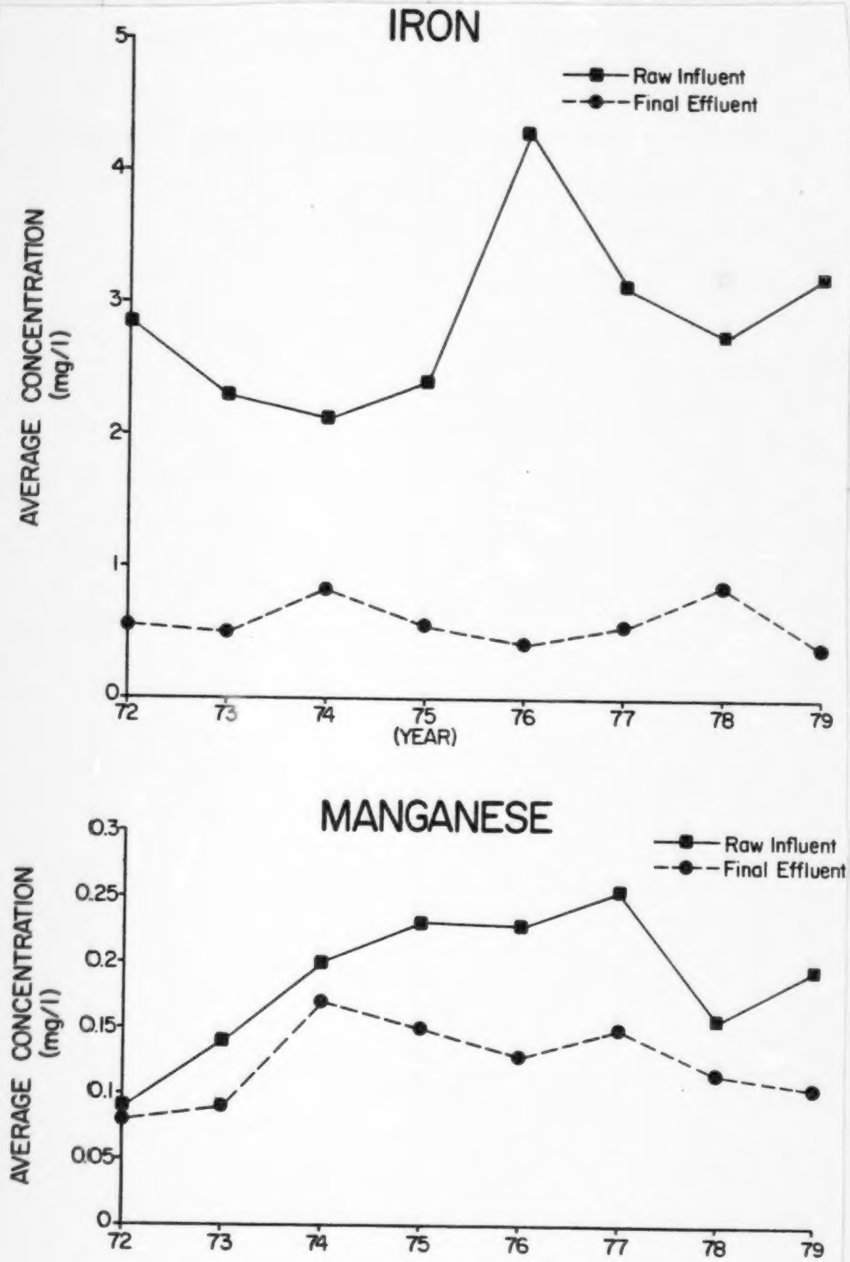

Figure 7. (Continued)

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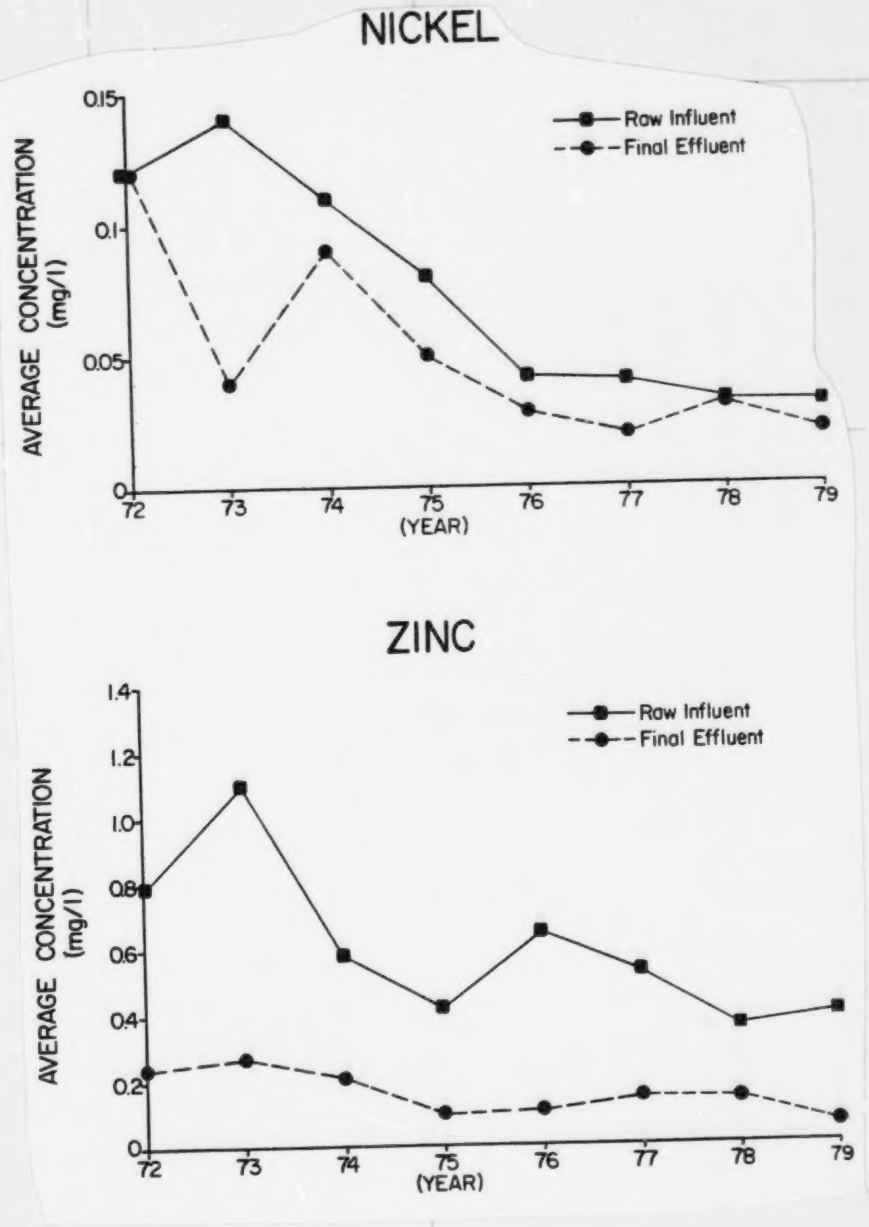

Figure 7. (Continued)

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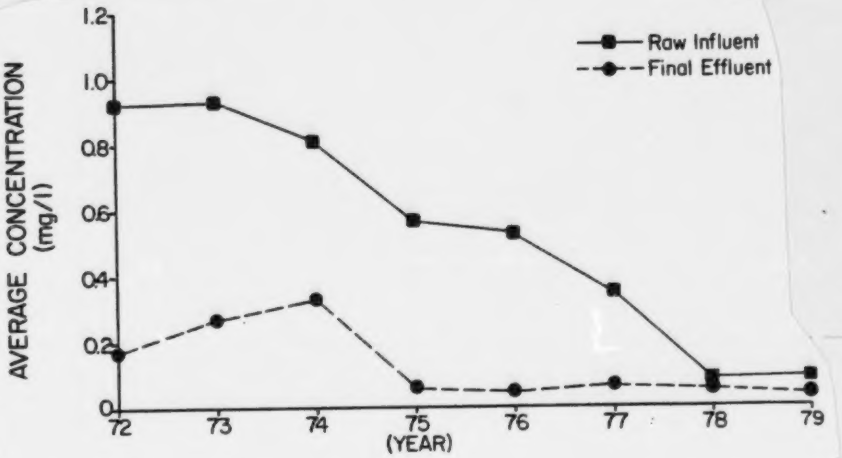
LEAD

Figure 7. (Continued)

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been a significant decrease in lead concentrations in the plant influent. It is interesting to note the relatively constant effluent concentration beginning in 1975. A probable explanation is the fact that the battery manufacturer began pretreatment and control steps to limit the soluble lead discharged to the sewer system. The MSD treatment plant was able to effectively remove the solids containing the insoluble lead compounds, leaving a fairly constant residual effluent value. The sludge data tends to support this conclusion.

Chromium, nickel and zinc also exhibit a somewhat constant decrease in concentration throughout the period. The average yearly concentrations of these metals decreased 72, 75, and 49 percent respectively from 1972 to 1979. Copper decreased from 0.25 mg/l in 1972 to .079 mg/l in 1977. The concentration increased to 0.188 mg/l in 1979. This was likely due to several factors, including increased discharge from the plating industry in Muncie and increased domestic flows.

Iron and manganese effluent concentrations increased during the eight year period. This is a result of discharges from wet scrubbers being used by a local foundry to control particulate losses. These metals are not specifically controlled by ordinance. The DWQ monitors these due to the high concentration of both in the city water supply. The treatment plant also receives significant loads of these metals from the backwash water from a local water treatment plant.

Cadmium concentrations have been monitored in the raw, final and sludge since 1974. Levels in the influent and effluent are normally below detection. Therefore these data are not presented. Sludge concentrations average below 0.5 mg/l. Loadings in the sludge average less than 0.5 lbs per day.

DIGESTED SLUDGE METAL CONCENTRATIONS

Changes in the concentrations of metals coming into the MSD wastewater treatment plant have resulted in changes in metal concentrations in the waste digested sludge. Table 21 shows the daily average concentrations in the digested sludge for seven metals from 1974 to 1979. The values are reported as mg/kg on a dry weight basis. The dry weight data are presented graphically in Figure 8.

TABLE 21. AVERAGE HEAVY METAL CONCENTRATIONS*
IN MSD DIGESTED SLUDGE

Year	Cr	Cu	Fe	Ni	Zn	Pb	Mn
1974	1,190	1,260	19,200	171	4,180	6,510	--
1975	730	914	21,900	171	3,880	6,010	1,390
1976	488	748	33,200	140	3,470	4,500	1,090
1977	712	672	30,245	157	3,652	3,234	985
1978	660	704	28,253	156	2,729	1,066	383
1979	612	719	26,538	181	2,591	793	505

*Values reported as mg/kg dry weight.

Concentrations of five of the seven metals reported decreased substantially from 1974 to 1979. Lead showed the largest decrease, from 6,510 mg/kg in 1974 to 793 mg/kg in 1979. Chromium, copper and zinc decreased by 49, 43, and 38 percent, respectively, during the six year period. Nickel increased slightly from 171 to 181 mg/kg. Iron concentrations increased from 19,200 to 26,536 mg/kg per day. This was expected due to the increase in the influent concentration to the treatment plant during that period. The increase was likely due to the discharge from a local water treatment facility and a foundry.

The 1979 values shown for chromium, copper, nickel, zinc and lead are significantly below the mean values for typical municipal sludges reported by EPA. Sommers and Nelson[2] have suggested that a criteria to

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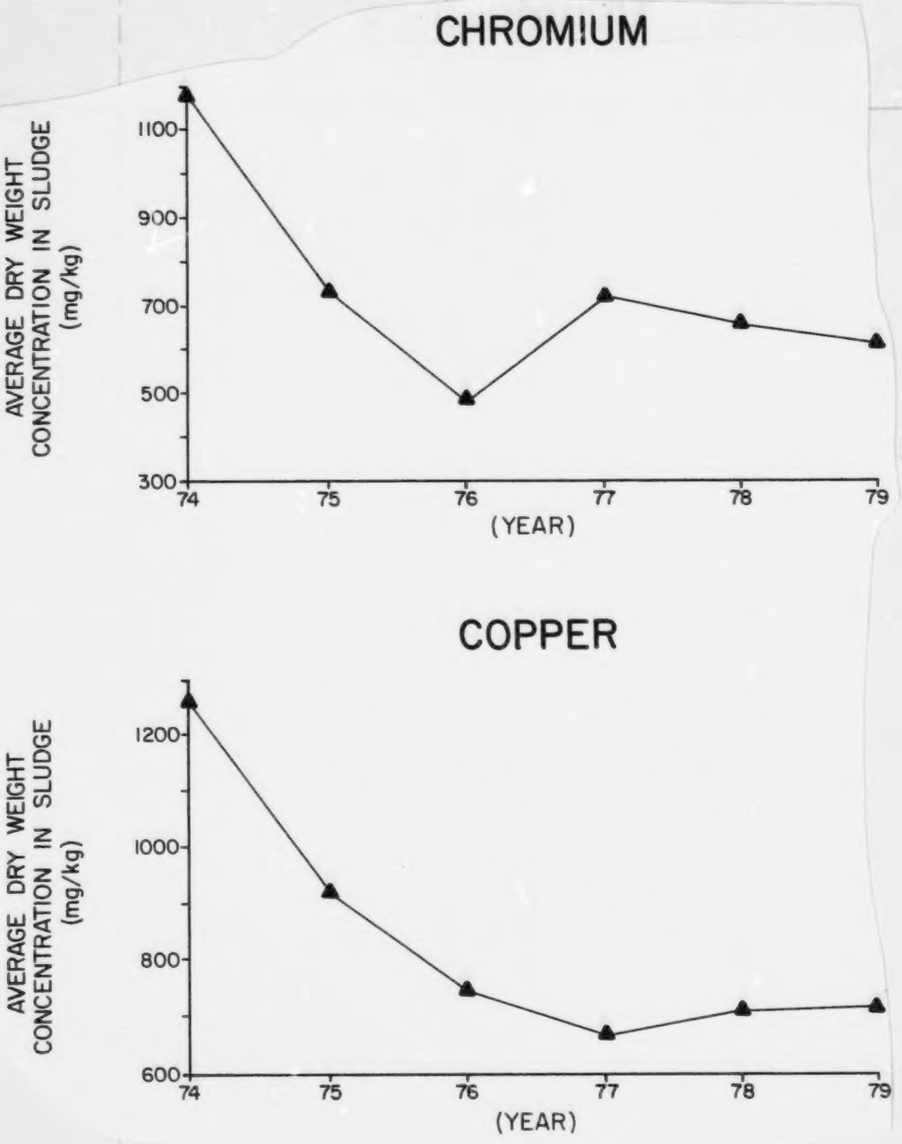

CHROMIUM

COPPER

Figure 8. Daily average metal concentrations in MSD digested sludge from 1974 through 1979.

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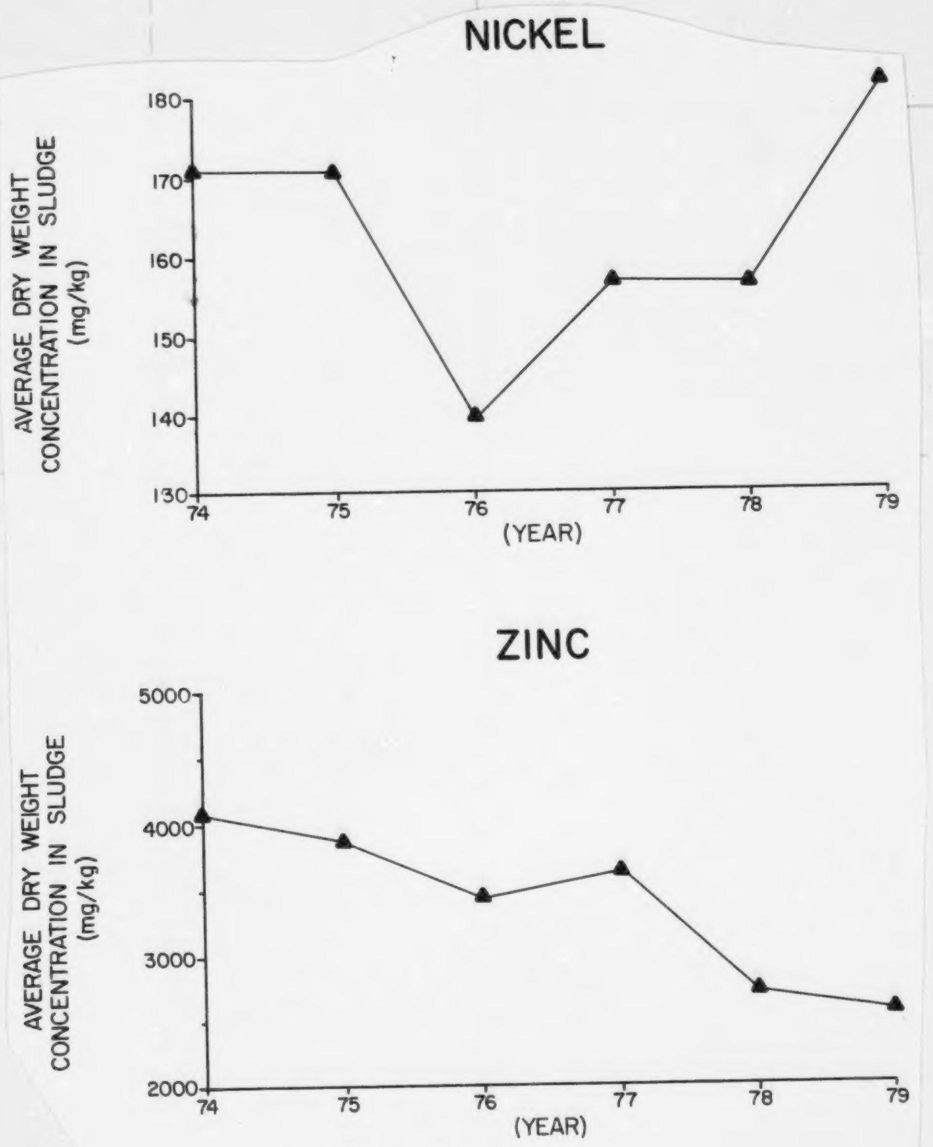

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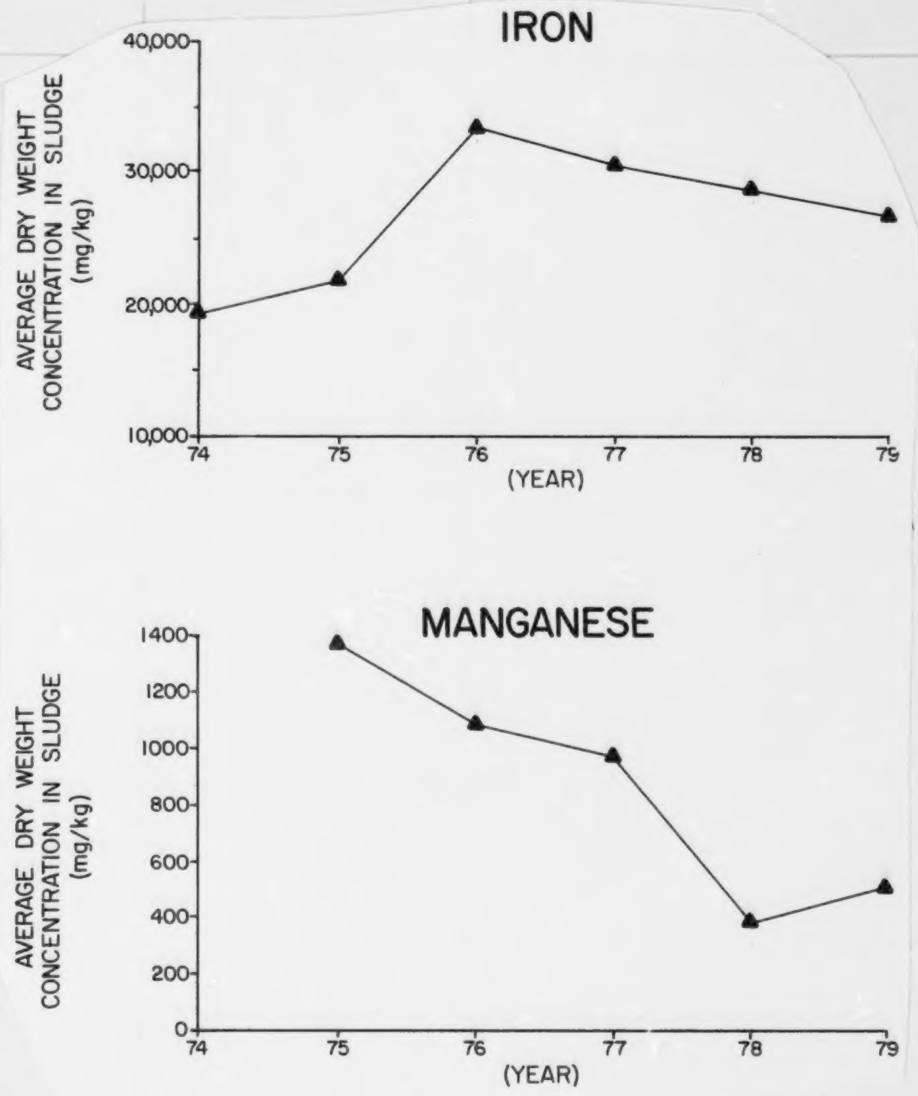

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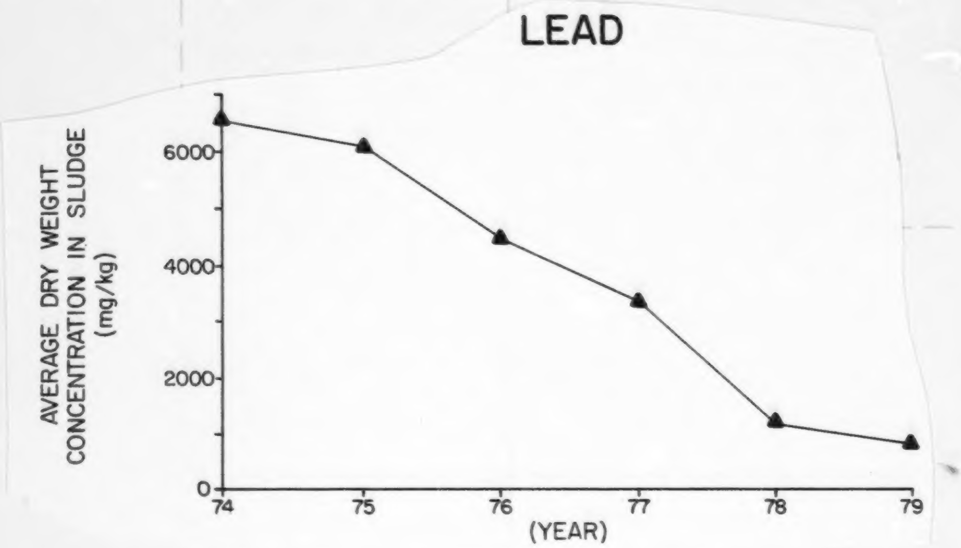

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prevent metal injury from sludge application on land be based upon the total amount of metals added in sludges. The maximum amount of metal (lbs/acre) would be a function of the soil cation exchange capacity. Applying this criteria to Muncie Sludge, the net result of the significant decreases in sludge metal concentrations means the MSD will need much less land area to dispose of sludge than would have been required in 1974.

For example, in 1974, the MSD treatment plant was producing sludge containing 142 lbs of lead per day or approximately 26 tons per year. In 1979, the sludge contained 8.4 lbs of lead per day or 1.53 tons of lead per year. Using criteria proposed by Sommers *et al.*, and assuming a soil cation exchange capacity of 5-15 milliequ (valents/100 grams), land requirements (based on lead loadings) would have decreased from 52 acres to 3.06 acres. The decreases in metal concentrations in the MSD sludge since the industrial monitoring and pretreatment program began have in effect decreased the ultimate amount of land necessary for land application, based on metal loadings, possibly making land application an economically feasible option for the MSD to continue into the future.

METAL LOADINGS

Table 22 presents influent, effluent and sludge loadings to the Muncie wastewater treatment plant for six heavy metals from 1972 through 1979. Sludge loadings data are not available for 1972 and 1973. Influent and effluent loadings were determined using yearly averages. Sludge loadings were calculated using averages of 10-day composites of metal concentrations and monthly sludge disposal volumes.

Figure 9 shows plots of the data in Table 22. The metal removal values were determined as the difference between influent and effluent readings. Also shown are the mass of metals removed by the treatment plant and the plant removal efficiency for each year.

The average daily loadings of chromium in the influent and sludge decreased substantially from 1972 through 1975, while the effluent loading remained relatively constant. This may suggest that some lower limit for effluent loading existed during that period, possibly due to solids removal capability of the plant. Plant removal efficiency averaged 79 percent, ranging from 64 percent to 93 percent.

Figure 9 shows that the average daily influent and effluent loading of copper decreased through 1977, then increased in 1978 and 1979. Removal efficiency dropped to 8 percent in 1979, averaging 64 percent.

The average daily influent loading of iron increased over the period of 1972 to 1979. However, the effluent and sludge loadings decreased slightly. A high influent loading of 661 lbs per day in 1976 did not result in a similar percentage increase in effluent loading. Removal efficiency averaged slightly above 79 percent.

Loadings of lead increased slightly in 1973 and 1976, but decreased significantly from 1972 to 1979. The decrease was a result of the startup of pretreatment facilities at a large lead-acid battery facility in Muncie. It is interesting to note that as the influent loading decreased from 82 lbs/day in 1976 to 13 lbs/day in 1978, effluent discharge went from 7.2 to 7.7 lbs/day for the same period. Consequently, removal efficiency dropped from 91 percent in 1976 to 44 percent in 1978. This may indicate some lower limit to the removal of lead. Removal efficiencies averaged nearly 74 percent over the eight year period.

Figure 9 indicates overall decreases in influent, effluent and sludge loadings of zinc for the eight year period. Influent and effluent loadings increased slightly in 1973 and decreased gradually each subsequent year. The average removal efficiency for the period was approximately 74 percent.

Influent and effluent nickel loadings decreased 75 and 83 percent respectively from 1972 to 1979. Removal efficiencies were lower than for other metals, averaging 25 percent.

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TABLE 22. METAL LOADINGS IN MSD PLANT INFLUENT, EFFLUENT AND SLUDGE
(lbs/day)

	Chromium			Copper			Iron			Nickel			Lead					
Year	Infl.	Effl.	Sludge	Inf.	Effl.	Sludge	Infl.	Effl.	Sludge	Infl.	Effl.	Sludge	Infl.	Effl.	Sludge	Infl.	Effl.	Sludge
1972	37	8.3	--	34.	11.	--	393.	75.9	--	17	17	--	130	24	--	109	33	--
1973	33	5.6	--	36	8.3	--	320	69.5	--	20	12	--	130	38	--	160	38	--
1974	18.4	5.3	21	25	7.9	22	280.6	109	355	14.5	11.9	3.2	110	43.5	142	76.4	27	67.2
1975	15	5.5	9.7	15	5.5	12	328	76.6	277	10.9	6.8	1.9	78	8.2	78.0	57.4	13	49.2
1976	14	1.2	9.2	17	3.1	12	661	64.6	554	6.5	4.5	2.5	82	7.2	77.7	99.5	17	58.4
1977	11.2	2.7	9.4	10.2	1.8	12.4	402.1	70.7	594.1	<5.1	<2.6	2.2	44.9	<7.7	44.4	68.1	19.3	49.5
1978	9.9	3.5	7.0	23	8.2	7.5	357	107	297	3.9	<3.9	1.6	13	7.7	11.3	97.3	18	28.5
1979	10.8	.6	5.9	27.2	25.9	7.2	465.4	62.2	285	4.3	2.9	1.7	14.5	4.3	8.2	57.8	8.1	26.2

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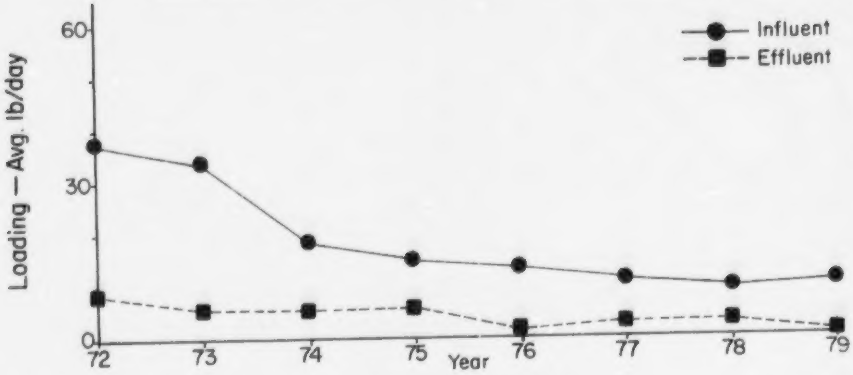
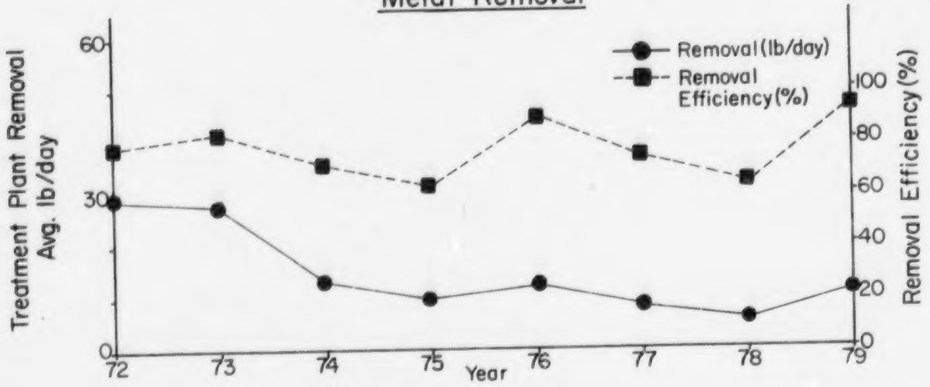
CHROMIUM

Metal Loading in Raw and Final Waste Stream



Metal Removal



Metal Loading in Sludge

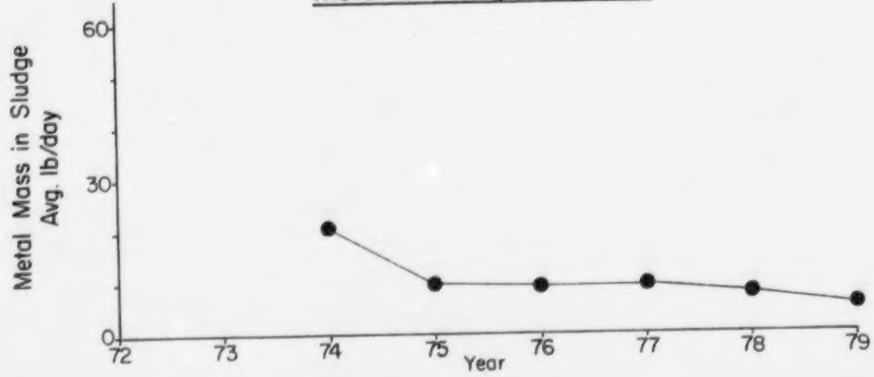


Figure 9. Metal loadings and metal removal at the MSD wastewater treatment plant.

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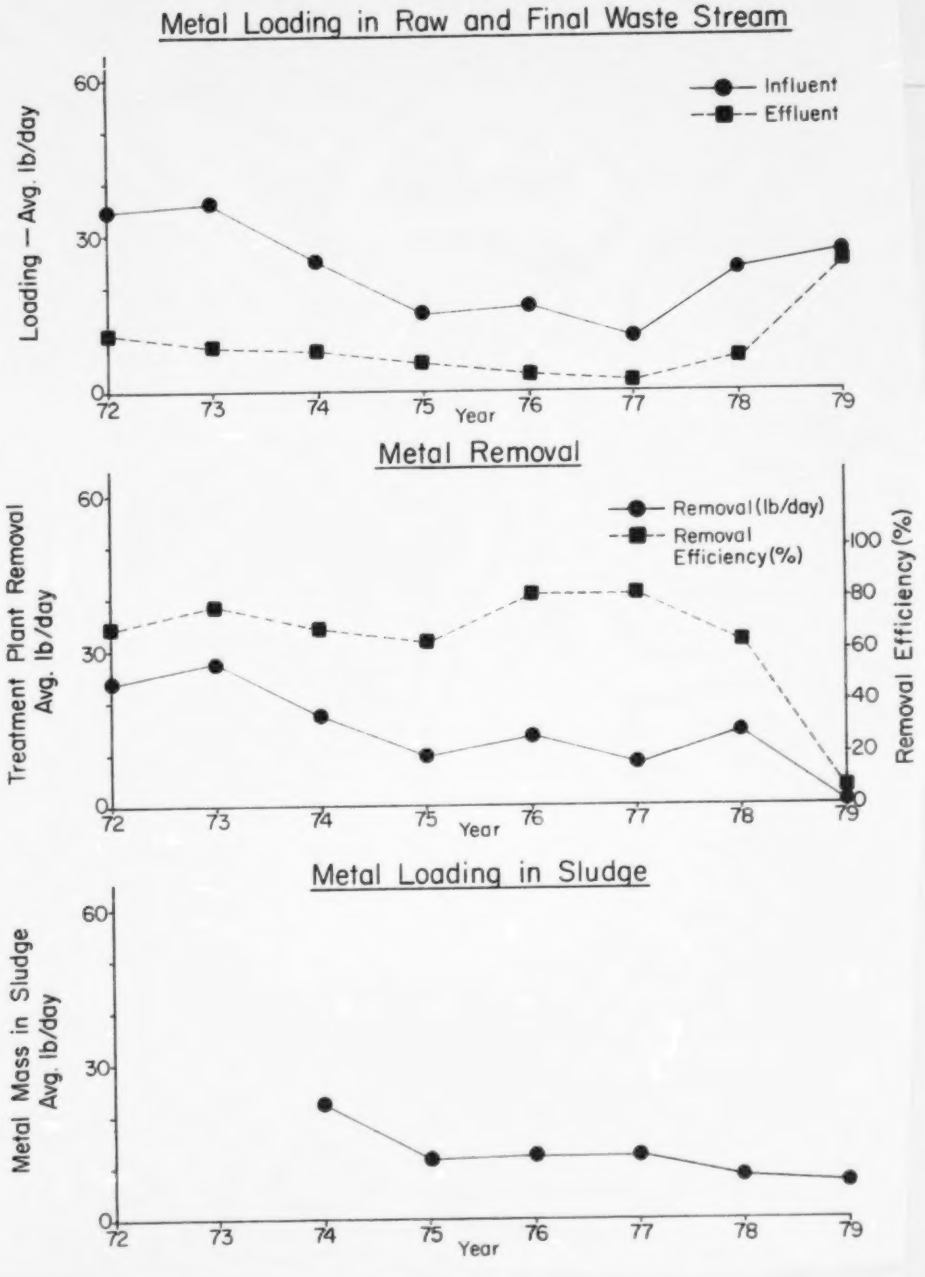
COPPER



Metal Loading in Raw and Final Waste Stream

Metal Removal

Metal Loading in Sludge

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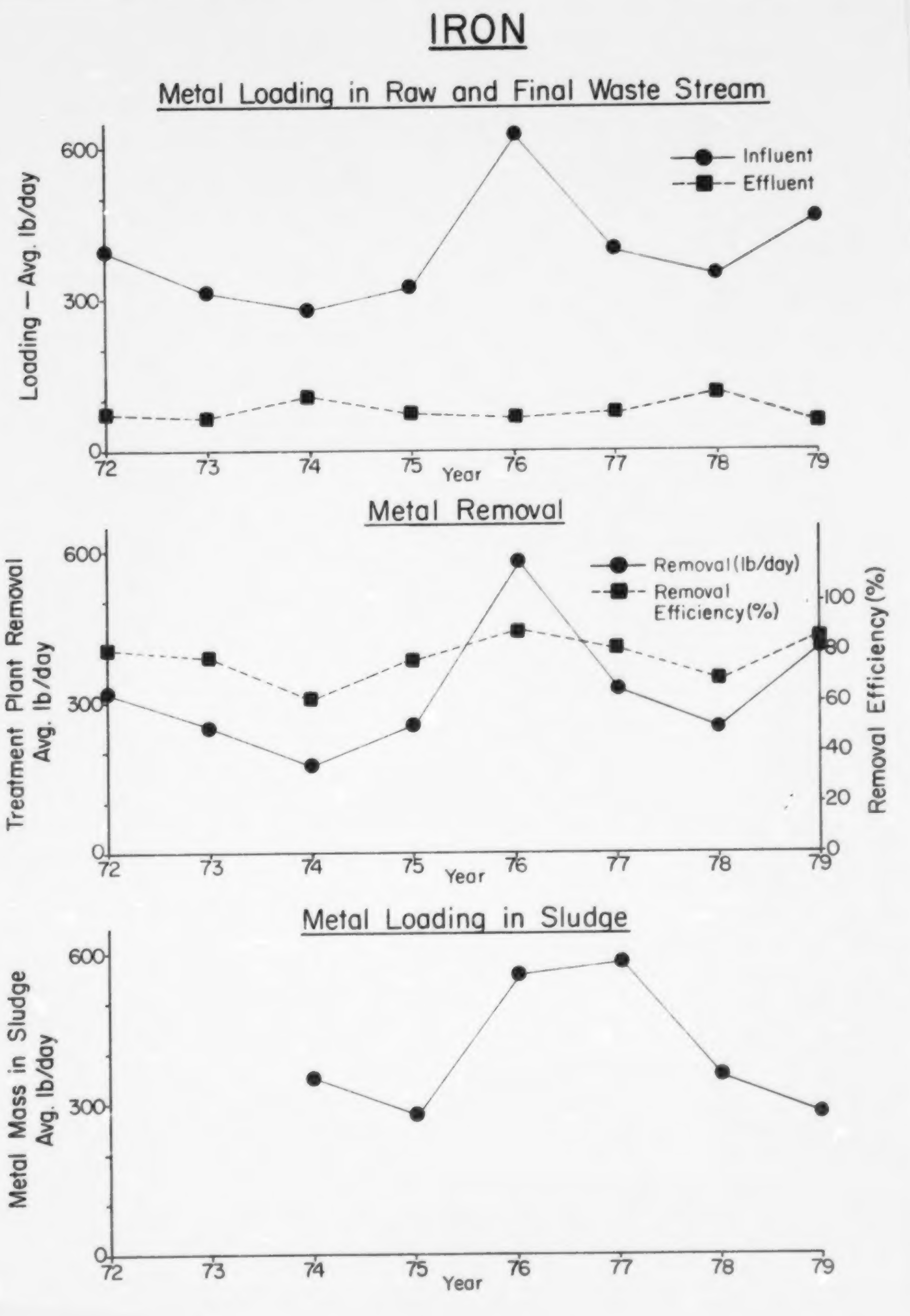

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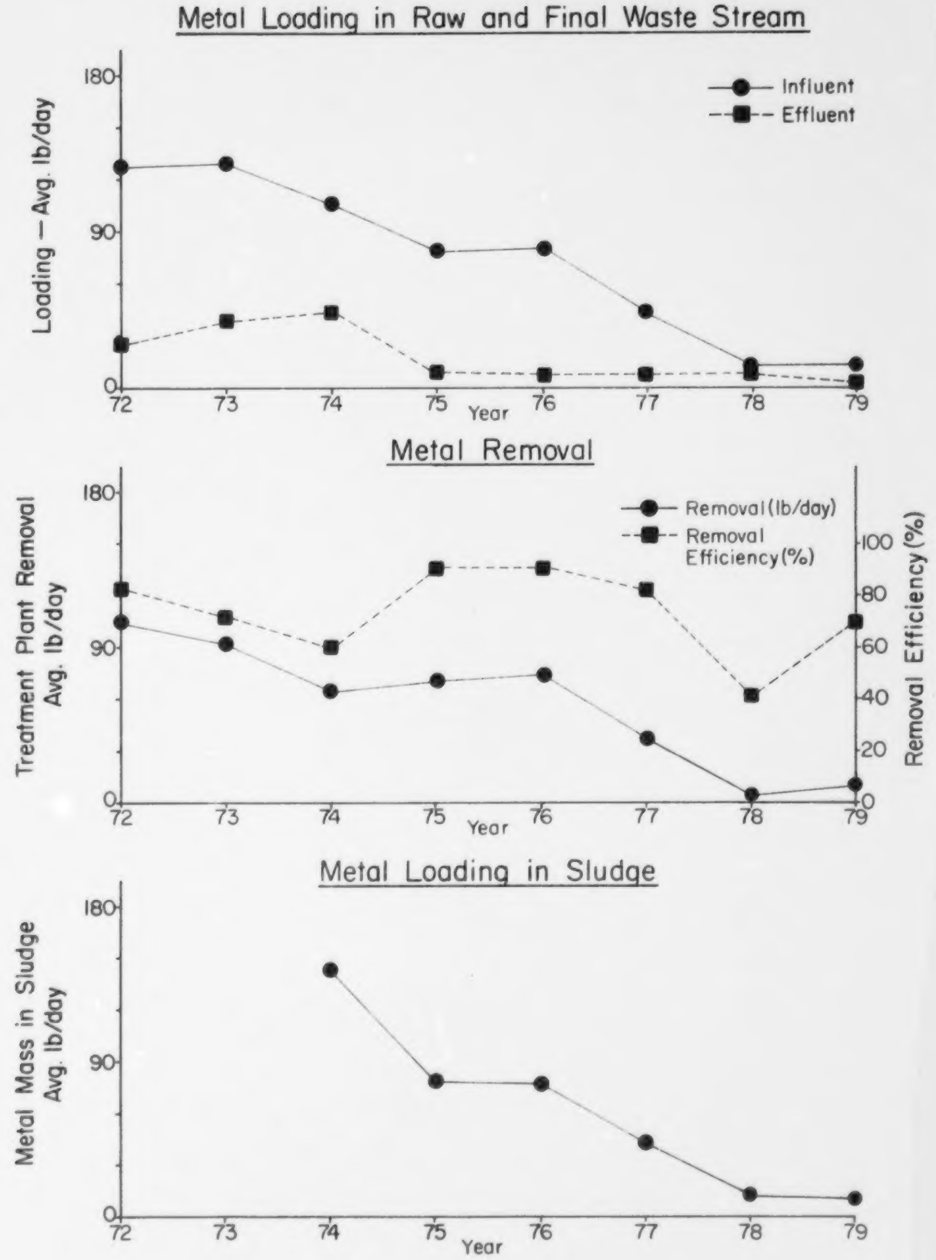

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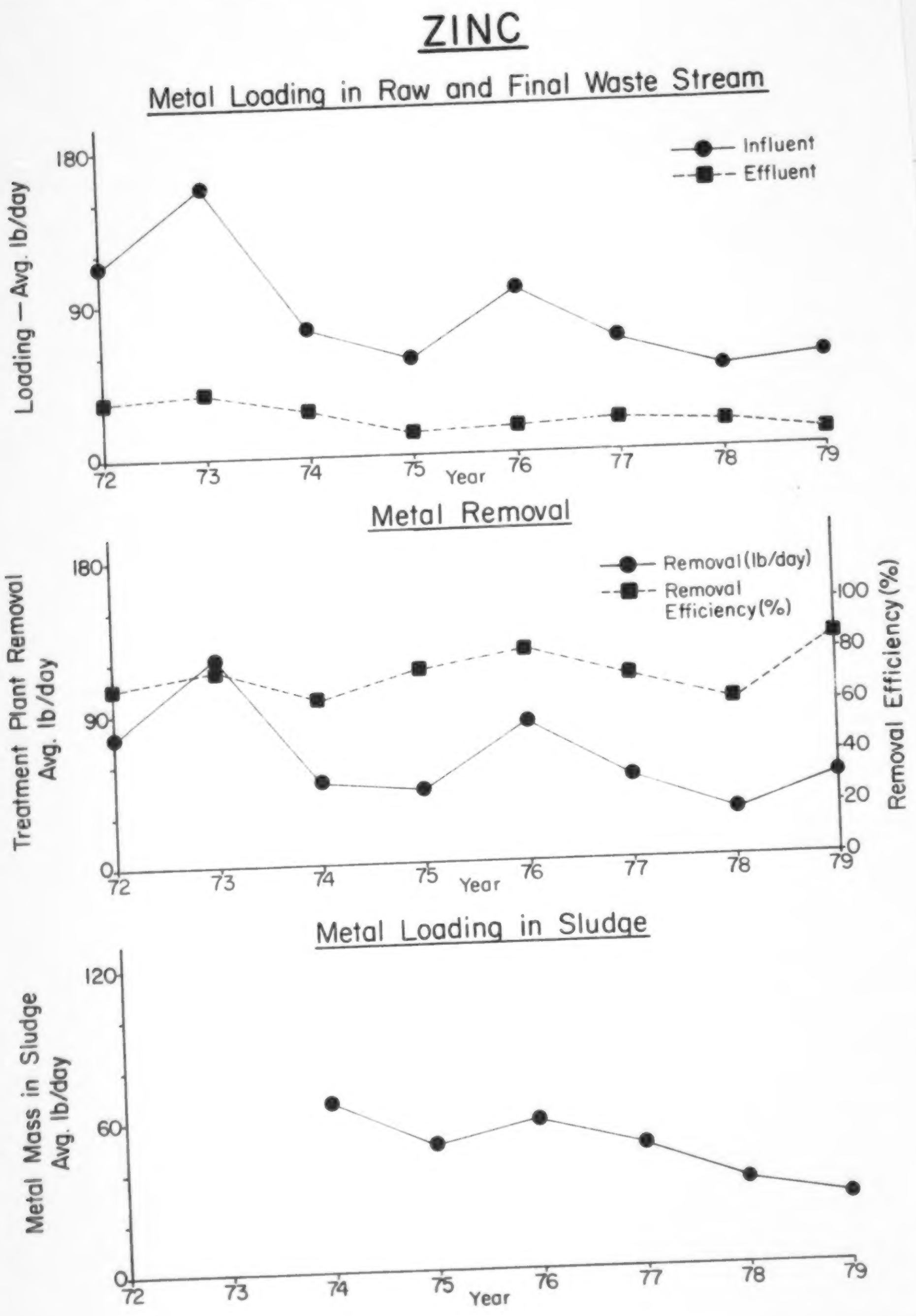

ZINC

Metal Loading in Raw and Final Waste Stream

Metal Removal

Metal Loading in Sludge

Figure 9. (Continued)

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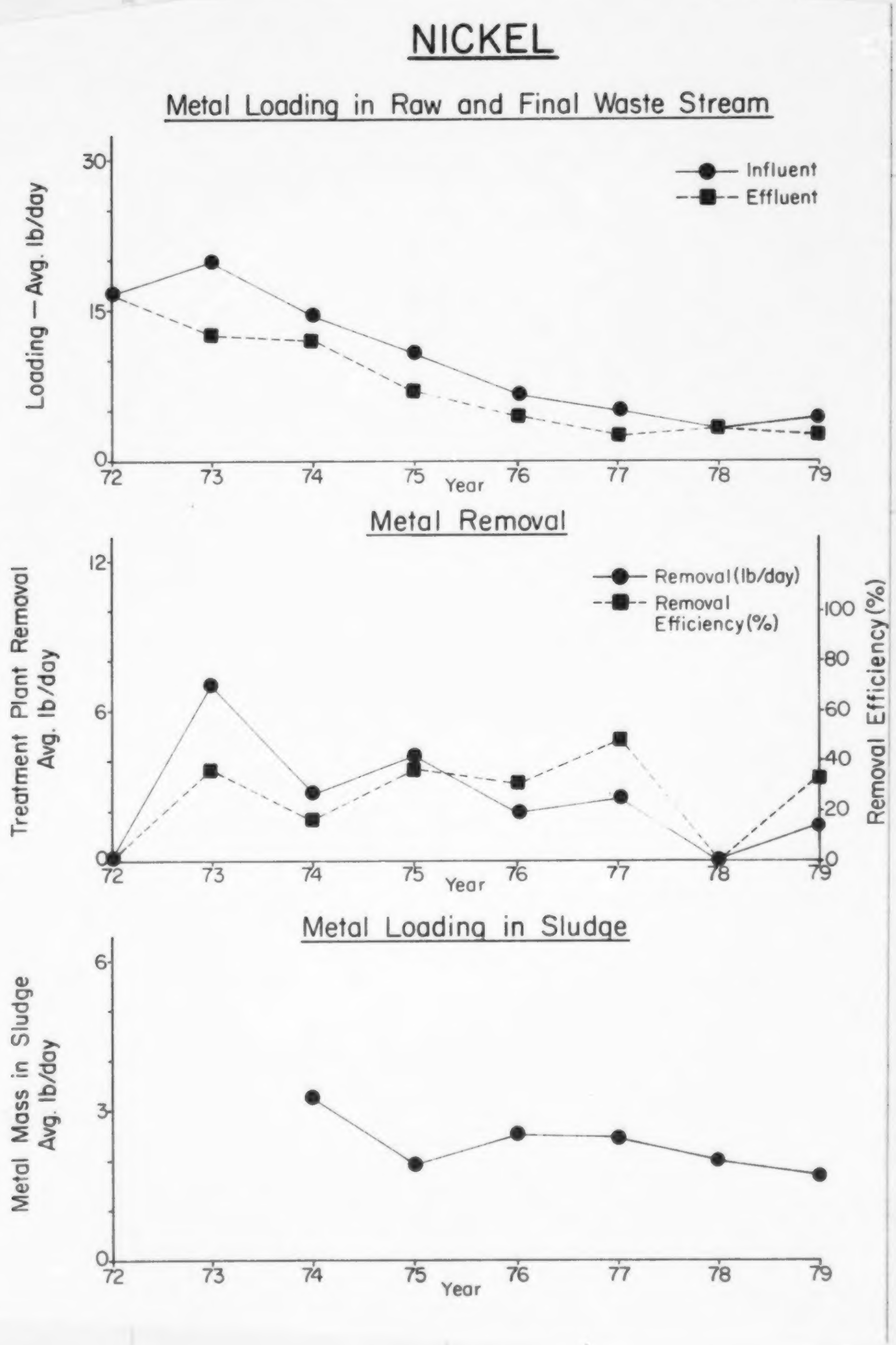

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Generally, the heavy metal loading values in the sludge correspond very well with the treatment plant removals. There are instances when these two numbers do not equate. In these cases, it is likely that the sludge loading values are in error, since sludge volume measurement errors are more likely than wastewater discharge flow measurement errors.

BOD_5 AND TSS LOADINGS

Table 23 presents monthly average influent BOD_5, TSS, and flow data at the MSD treatment plant from 1972 through 1980. The monthly high and low values are also presented. Table 24 presents monthly average effluent BOD_5 and TSS data from 1972 through 1980. The data in Tables 23 and 24 are presented in graphical forms in Figures 10, 11, and 12.

TABLE 23. MONTHLY AVERAGE INFLUENT BOD_5, TSS AND FLOW DATA FOR THE MSD TREATMENT PLANT

Year 1972	BOD_5 (mg/l) High	BOD_5 (mg/l) Low	BOD_5 (mg/l) Avg.	TSS (mg/l) High	TSS (mg/l) Low	TSS (mg/l) Avg.	Flow (MGD) High	Flow (MGD) Low	Flow (MGD) Avg.
1972	201	91	142	167	80	145	20	13	17
1973	125	97	110	164	99	134	21	14	17
1974	169	82	121	174	128	153	18	13	16
1975	136	77	117	175	108	133	21	13	17
1976	189	99	144	246	124	169	20	16	22
1977	175	91	129	200	90	137	19	11	15
1978	158	64	90	189	87	136	19	11	15
1979	100	52	79	229	126	156	20	15	17
1980	106	59	86	295	118	179	23	14	18

TABLE 24. MONTHLY AVERAGE EFFLUENT BOD_5 AND TSS DATA FOR THE MSD TREATMENT PLANT

Year 1972	BOD_5 (mg/l) High	BOD_5 (mg/l) Low	BOD_5 (mg/l) Avg.	TSS (mg/l) High	TSS (mg/l) Low	TSS (mg/l) Avg.
1972	39	7	17	54	9	23
1973	35	9	16	38	9	17
1974	29	3	15	38	13	26
1975	21	10	13	28	8	13
1976	19	7	11	16	7	11
1977	21	12	15	23	7	16
1978	29	8	18	6	12	34
1979	37	6	26	179	14	80
1980	65	3	24	147	2	49

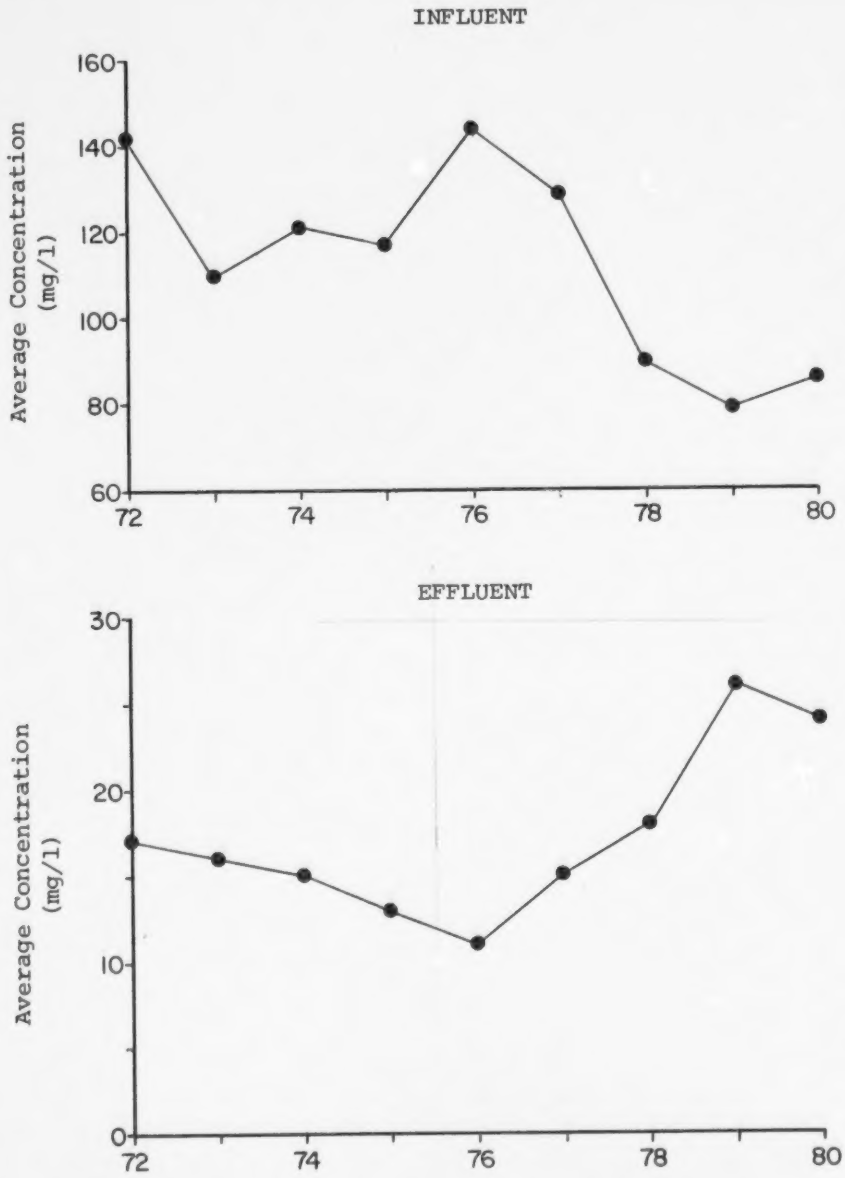

Figure 10. Average monthly influent and effluent BOD_5 concentrations at the MSD treatment plant.

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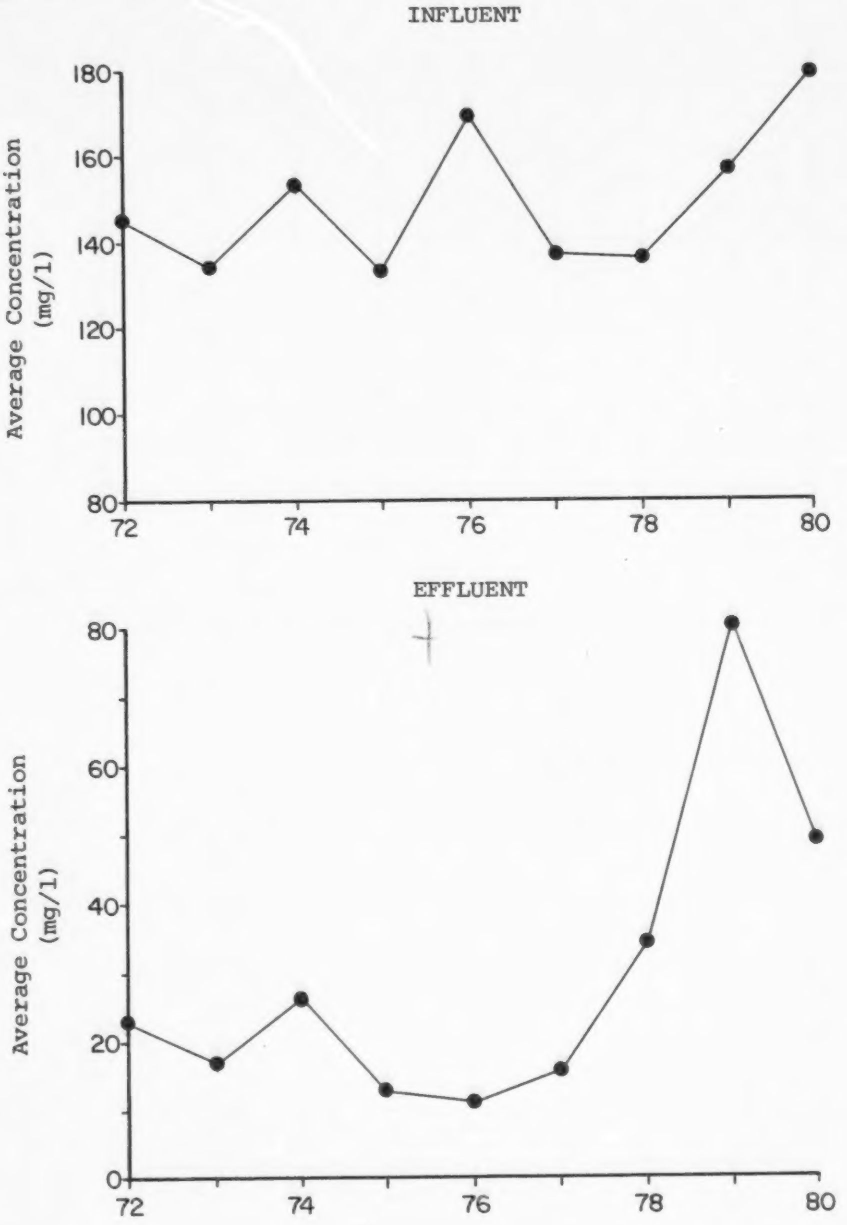

Figure 11. Average monthly influent and effluent TSS concentrations at the MSD treatment plant.

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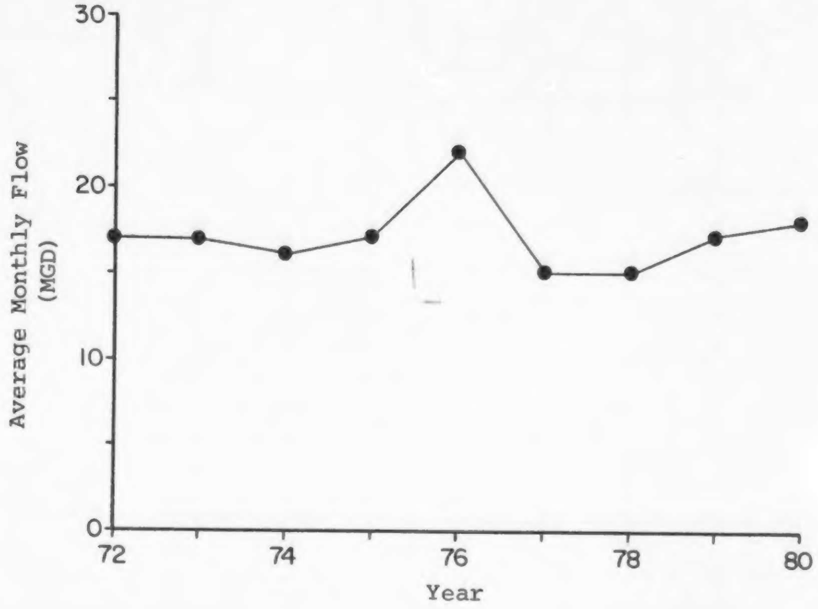

Figure 12. Average monthly flow into the MSD treatment plant.

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SECTION 7

BENEFITS OF LOCAL WATER QUALITY CONTROL

LOCAL INVOLVEMENT

The approach of the MSD to helping to solve water pollution problems at the local level has provided the people of Muncie with a mechanism to become involved in decisions affecting their water resources. Since the addition of the DWQ to the MSD in 1972, the residents of Muncie have been able to call upon a local agency for help with all aspects of water pollution control and protection of local water resources.

Important aspects of community life, such as control of waterborne diseases, improvement of local swimming and fishing areas in the streams passing through Muncie, and proper operation of the wastewater treatment plant, can be managed at the local level with the help of federal and state agencies, rather than vice versa. Nearly every community has input and control over its own fire and police services. Muncie has a similar influence over water pollution control.

Muncie's water pollution control program works as a communication link between local residents and industry, and various state and federal water pollution control agencies. The Muncie Industrial and Commercial Clean Water and Waste Management Council is one example. This organization provides the forum for the DWQ, the state and the Muncie industrial community to exchange ideas and information. When new laws or regulations are proposed on the federal, state or local level, the Council often comments on these proposals.

WATER RESOURCES ENHANCEMENT

The enhancement of Muncie's water resources for the enjoyment of all citizens has been a basic objective of the MSD since its inception in 1964. All of the local water related ordinances, together with existing state water quality standards and federal laws, serve as the foundation for the MSD programs.

Numerous projects and activities are underway to improve the quality of water in the White River and its major tributaries. The MSD's wastewater treatment facilities have recently undergone a major expansion. New multi-media sand filters have been added to improve the quality of the discharge to the White River. It is anticipated that this expansion will have a positive effect on the quality of the river. Increased D.O. levels will enhance the ability of the river to support clean water species of fish. The river will be more attractive for boating and fishing.

The work of the DWQ with industries in Muncie has resulted in a significant decrease of metals discharged to the White River either through the treatment plant or directly to receiving streams. The DWQ stream baseline monitoring program has resulted in the identification and cleanup of many illegal discharges of sewage and industrial wastes. Approximately 26,000,000 gallons of raw sewage has been diverted to the MSD treatment plant since 1972. Nearly 2000 illegal discharges along 100 miles of the White River were identified by the DWQ as part of the 208 Planning Study conducted in tha Muncie area. The parking lot runoff study results may establish the need to control or treat runoff in the Muncie area.

BENEFITS TO INDUSTRY

Muncie's water quality control program is benefiting the local industrial community. To solve industrial water pollution control problems, industry leaders have been able to deal with a local regulatory agency whose primary concern is solutions to local problems. Industry has participated in the development of the ordinances controlling their discharges to the wastewater treatment plant. The DWQ keeps all industrial leaders up to date on new water laws and regulations which affect them. The DWQ has conducted educational seminars explaining the need to control the quality of wastes discharged from industrial users to the Muncie treatment plant and how this discharge affects water quality in the White River.

The large data base maintained by the DWQ has served to clarify industry's position with respect to the need for additional treatment. In some instances, attempts have been made by state agencies to require treatment of industrial discharges that were shown to be unwarranted, based upon this data base.

Industry managers in Muncie support the activities of the DWQ and will continue to do so as long as the programs are realistic and cost effective.

REFERENCES

1. Municipal Sludge Management: Environmental Factors. EPA 430/9-77-004, U.S. Environmental Protection Agency, Office of Water Program Operations, Washington, D.C., 1977. 31 pp.

2. Sommers, L. E., and D. W. Nelson. Application of Sludges and Wastewater on Agricultural Land: A Planning and Educational Guide. North Central Regional Research Publication 235, North Central Regional Committee (ND-118), West Lafayette, Indiana, 1976.

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APPENDIX A

RESOLUTION ESTABLISHING WATER POLLUTION CONTROL OF THE WASTE WATER DISCHARGE TO THE MUNCIE SANITARY DISTRICT CITY OF MUNCIE, INDIANA

WHEREAS the Muncie Sanitary District of the City of Muncie, Indiana owns and operates a Sewage Treatment Works and owns and maintains a sewage system for said District for the treatment and disposal of sewage in a sanitary manner and same is being operated pursuant to Chapter 61 of the Acts of the Indiana General Assembly for the year 1932 (Special Session) and the acts amendatory thereof and supplemental thereto; and

WHEREAS the Board of Sanitary Commissioners of the Muncie Sanitary District is charged with the operation, maintainance, extensions, additions and improvements to the Sewage System of the Muncie Sanitary District and in the transporting and treating the sewage and industrial waste of said District; and

WHEREAS the Muncie Sanitary District realizes the importance of controlling water pollution and having standards for testing the amount of waste water discharge in compliance with certain federal and state laws; and

WHEREAS the Board of Sanitary Commissioners of the Muncie Sanitary District now finds that the existing standards and testing procedures are inadequate to properly control waste water discharge and that the testing procedures need to be standardized for the more efficient operation of the Sanitation Board personnel as well as to allow the general population and industry to have standards for determining what their waste water discharge is;

NOW THEREFORE BE IT RESOLVED:

Chapter 1

GENERAL PROVISIONS

1.01 Purpose and Policy. This Wastewater Discharge Ordinance sets uniform requirements for discharges into the wastewater collection and treatment system and enables the Agency to comply with the administrative provisions of the Indiana Stream Pollution Control Board and the applicable effluent limitations, national standards of performance, toxic and pretreatment effluent standards, and any other discharge criteria which are required or authorized by state or federal law, and to derive the maximum public benefit by regulating the quality and quantity of wastewater discharge into those systems. This ordinance provides for the setting of user charges and fees for the equitable distribution of cost to all users, and the issuance of permits to certain

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users. Revenues derived from the application of this ordinance shall be used to defray the Agency's cost of operating and maintaining an adequate wastewater collection and treatment system and to provide sufficient funds for capital outlay, bond service costs, capital improvements and depreciation.

1.02 Definitions. Unless otherwise defined herein, terms shall be adopted in the latest edition of *Standard Methods for the Examination of Water and Wastewater,* published by the American Water Works Association and the Water Pollution Control Federation or *Methods for Chemical Analysis of Water and Wastes,* by the Environmental Protection Agency. Waste constituents and characteristics shall be measured by Standard Methods unless expressly stated, or as established by federal or state regulatory agencies.

a. "Agency" - The Muncie Sanitary District.

b. "Authorization" - Written letter authorizing various conditions of wastewater discharges.

c. "Building Sewer" - A sewer conveying wastewater from the premises of a user to a community sewer.

d. "Beneficial Uses" - Uses of the waters of the state that may be protected against quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural and industrial supply, power generation, recreation, aesthetic enjoyment, navigation and the preservation and enhancement of fish, wildlife and other aquatic resources or reserves, and other sues, both tangible or intangible as specified by federal or state law.

e. "Community Sewer" - A sewer owned and operated by the Agency.

f. "Compatible Pollutant" - Biochemical oxygen demand, suspended solids, pH and fecal Coliform bacteria, plus additional pollutants identified in the Agency's National Pollutant Discharge Elimination System (NPDES) permit if the publicly owned treatment works was designed to treat such pollutants, and in fact does remove such pollutants to a substantial degree. While the term "substantial removal" is not subject to precise definition, it generally contemplates removals in the order of 80 percent or greater. Minor incidental removals in the order of 10 to 30 percent are not considered "substantial."

g. "Director" - The Director of the Division of Water Quality or his designated representative.

h. "Division" - Division of Water Quality of the Muncie Sanitary District.

i. "Incompatible Pollutant" - Any pollutant which is not defined as a compatible pollutant.

j. "Holding Tank Waste" - Any waste from holding tanks including but not limited to septic tank waste and waste from vacuum pump tank trucks.

k. "General Manager" - The manager of the Agency.

l. "Federal Act" - The Federal Water Pollution Control Act, PL 92-500, and any amendments thereto; as well as any guidelines, limitations, and standards promulgated by the Environmental Protection Agency pursuant to the Act.

m. "Mass Emission Rate" - The weight of material discharge to the sewer system during a given time interval. Unless otherwise specified, the mass emission rate shall mean pounds per day of a particular constituent or combination of constituents.

n. "Person" - Any individual, partnership, firm, association, corporation or public agency including the State of Indiana and the United States of America.

o. "Pollution" - An alteration of the quality of the waters of the state by waste to a degree which unreasonably affects such waters for beneficial use or facilities which serve such beneficial uses.

p. "Premises" - A parcel of real estate including any improvements thereon which is determined by the Agency to be a single user for purposes of receiving, using and paying for service.

q. "Unpolluted Water" - Water to which no constituent has been added, either intentionally or accidentally, which would render such water unacceptable to the agency having jurisdiction thereof for disposal to storm or natural drainages or directly to surface waters.

r. "User" - Any person that discharges, causes or permits the discharge of wastewater into a community sewer.

s. "User Classification" - A classification of user based on the 1972 edition of the *Standard Industrial Classification (SIC) Manual,* prepared by the Executive Office of Management and Budget.

t. "Waste" - Includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing or processing operation of whatever nature, including such waste placed within containers of whatever nature prior to, and for purposes of, disposal.

u. "Wastewater" - Waste and water, whether treated or untreated, discharged into or permitted to enter a community sewer.

v. "Wastewater Constituents and Characteristics" - The individual chemical, physical, bacteriological and radiological parameters, including volume and flowrate and such other parameters that serve to define, classify or measure the contents, quality, quantity and strength of wastewater.

w. "Waters of the State" - Surface water within the boundaries of the state.

Chapter 2

REGULATIONS

2.01 Prohibited Practices. No person shall discharge to a community sewer wastes which cause, threaten to cause, or are capable of causing either alone or by interaction with other substances the following:

a. A fire or explosion;

b. Obstruction of flow in a sewer system or injury of the system or damage to the wastewater collection, treatment or disposal facilities;

c. Danger to life or safety of personnel;

d. A nuisance or prevention of the effective maintenance or operation of the sewer system;

e. Air pollution by the release of toxic or malodorous gases or malodorous gas-producing substances;

f. Interference with the wastewater treatment process for the quality of the effluent as established by the NPDES permit;

g. Discoloration or any other condition in the quality of the Agency's treatment works effluent in such a manner that receiving water quality requirements established by law cannot be met;

h. Conditions at or near the Agency's treatment works which violate any statute or any rule, regulation, or ordinance of any public agency or state or federal regulatory body;

i. Quantities or rates of flow which overload the Agency's collection or treatment facilities or cause excessive Agency collection or treatment costs, or may use a disproportionate share of the Agency facilities.

2.02 Prohibitions on Storm Drainage and Ground Water. Storm water, ground water, rain water, street drainage, subsurface drainage or yard drainage will not be discharged through direct or indirect connections to a community sewer unless authorized by the Agency. The Division may approve the discharge of such water only when no reasonable alternative method of disposal is available. If authorization is granted for the discharge of such water into a community sewer the user shall pay the applicable user charges and fees and meet such other conditions as required by the Agency.

2.03 Prohibition on Unpolluted Water. Unpolluted water, including, but not limited to cooling water, process water or blow-down from cooling towers or evaporative coolers will not be discharged through direct or indirect connection to a community sewer unless authorization is issued by the Agency. The Agency may approve the discharge of such water only when no reasonable alternative method of disposal is available.

If authorization is granted for the discharge of such water into a community sewer the user shall pay the applicable user charges and fees and shall meet such other conditions as required by the Agency.

2.04 Limitations on Radioactive Wastes. No person shall discharge or cause to be discharged, any radioactive waste into a community sewer except:

a. When the person is authorized to use radioactive materials by the State Department of Health of other governmental agency empowered to regulate the use of radioactive materials, and

b. When the waste is discharged in strict conformity with current Indiana State Board of Health regulations and recommendations for safe disposal, and

c. When the person is in compliance with all rules and regulations of all other applicable regulatory agencies.

2.05 Limitations on the Use of Garbage Grinders. Waste from garbage grinders shall not be discharged into a community sewer except:

a. Wastes generated in preparation of food normally consumed on the premises, or

b. Where the user has obtained authorization for that specific use from the Agency, and agrees to undertake whatever self-monitoring is required to enable the Agency to equitably determine the user charges based on the waste constituents and characteristics.

Such grinders must shred the waste to a degree that all particles will be carried freely under normal flow conditions prevailing in the community sewer. Garbage grinders shall not be used for grinding plastic, paper products, inert materials or garden refuse.

2.06 Limitation on Point of Discharge. No person shall discharge any substances directly into a manhole or other opening in a community sewer other than through an approved building sewer, unless upon authorization by the Agency.

2.07 Industry Holding Tank Waste. A user proposing to discharge holding tank waste, where pre-treatment is not provided, into a community sewer must secure a permit from the Division. This permit will state the specific location of discharge, the time of day the discharge is to occur, the volume of the discharge and the wastewater constituents and characteristics. If authorization is granted for discharge of such waste into a community sewer, the user shall pay the applicable user charges and fees and shall meet other such conditions as required by the Division.

2.08 Limitations on Wastewater Strength

2.08.1 No person shall discharge, on a dialy average, wastewater containing in excess of:

0.2 mg/1 cadmium
2.0 mg/1 copper
2.0 mg/1 cyanide
2.0 mg/1 lead
2.0 mg/1 nickel
2.0 mg/1 total chromium
4.0 mg/1 zinc

Maximum discharge at any time shall not exceed 3 times the allowed daily average.

2.08.2 No person shall discharge any wastewater:

a. Having a temperature higher than 150°F (65.5°C).

b. Containing more than 100 mg/1 of oil or grease of animal or vegetable origin.

c. Containing more than 40 mg/1 of oil or grease of mineral or petroleum origin.

d. Having a pH lower than 5.5 or above 9.0 unless authorized by the Agency.

2.08.3 Effluent limitations promulgated by the Federal Act shall apply in any instance where they are more stringent than those in this ordinance. Under section 307(b) of the Act, federal pre-treatment standards are designed to achieve two purposes: (1) to protect the operation of publicly owned treatment works, and (2) to prevent the discharge of pollutants which pass through such works inadequately treated. Users in industrial categories subject to effluent guidelines issued under Section 304(b) of the Act, which are discharging incompatible pollutants to publicly owned treatment works, are required to adopt best practicable control technology currently available, as defined by the administratory pursuant to Section 304(b) of the Act. Where the treatment works was designed to and does achieve substantial removal of pollutants other than the four pollutants listed in the definition for compatible pollutants in Section 1.02c (BOD, suspended solids, pH, and fecal coliform bacteria), it is not appropriate to require the industrial user to achieve best practicable control technology currently available since this would lead to an uneconomical duplication of treatment facilities. While the term "substantial removal" is not subject to precise definition, it generally contemplates removals in the order of 80 percent or greater. Minor incidental removals in the order of 10 to 30 percent are not considered "substantial." For some industrial categories it may be necessary to define pre-treatment guidelines for problems that may arise as a result of the discharge into publicly owned treatment works. However, any adjustments required for particular industrial categories should be considered in connection with the Division's requirements rather that the national pretreatment standard. Limitations on wastewater strength in Sections 2.08.1 and 2.08.2 of this ordinance may be supplemented with more stringent limitations pursuant to Section 4.02.4:

a. If the Division determines that the limitations in Sections 2.08.1 and 2.08.2 may not be sufficient to protect the operation of the treatment works, or

b. If the Division determines that the limitations in Sections 2.08.1 and 2.08.2 may not be sufficient to enable the treatment works to comply with water quality standards or effluent limitations specified in the Division's National Pollutant Discharge Elimination System (NPDES) permit.

Chapter 3

WASTEWATER VOLUME DETERMINATION

3.01 Metered Water Supply. User charges and fees shall be based upon the total amount of water used from all sources unless, in the opinion of the Division, significant portions of water received are not discharged to a community sewer. The total amount of water used from public and private sources will be determined by means of public meters or private meters, installed and maintained at the expense of the user and approved by the Division.

3.02 Metered Wastewater Volume and Metered Diversions. For users where, in the opinion of the Division, a significant portion of the water received from any metered source does not flow into the community sewer because of the principal activity of the user or removal by other means, the user charges and fees will be applied against the volume of water discharged from such premises into the community sewer. Written notification and proof of the diversion of water must be provided by the user if the user is to avoid the application of the user charges and fees against the total amount of water used from all sources. The user may install a meter of a type and at a location approved by the Agency and at the user's expense. Such meters may measure either the amount of sewage discharge or the amount of water diverted. Such meters shall be tested for accuracy at the expense of the user when deemed necessary by the Agency.

3.03 Estimated Wastewater Volume.

3.03.1 Users without source meters. For users where, in the opinion of the Division, it is unnecessary or impractical to install meters, the quantity of wastewater may be based upon an estimate prepared by the Director. This estimate shall be based upon a rational determination of the wastewater discharged and may consider such factors as the number of fixtures, seating capacity, population equivalent, annual production of goods and services or such other determinants of water use necessary to estimate the wastewater volume discharged.

3.03.2 Users with source meters. For users who, in the opinion of the Director, divert a significant portion of their flow from a community sewer, the user charges may be based upon an estimate of the volume prepared by the user, provided the user obtains wastewater discharge Authorization and pays the applicable user charges and fees. The estimate must include the method and calculations used to determine the wastewater volume and may consider such factors as the number of fixtures, seating capacity, population equivalents, annual production of goods and services, or such other determinations of water use necessary to estimate the wastewater volume discharged.

Chapter 4

ADMINISTRATION

4.01 Discharge Reports. The Agency shall require that any person discharging or proposing to discharge wastewater into a community sewer file a periodic discharge report if the provisions of 2.01, 2.04, 2.05, 2.07 or 2.08 are violated. The discharge report may include, but not be limited to, nature of process, volume, rates of flow, mass emission rate, production quantities, hours of operation, number and claassification of employees, or other information which relates to the generation of waste including wastewater constituents and characteristics in the wastewater discharge. Such reports may also include the chemical constituents and quality of liquid or gaseous materials stored on site even though they may not normally be discharged.

4.02 Wastewater Discharge Authorization.

4.02.1 All major users proposing to connect or to discharge into a community sewer must obtain authorization before connecting to or discharging into a community sewer. All existing major users connected to or discharging into a community sewer must obtain authorization 90 days after the effective date of this ordinance. For purposes of this ordinance a major user is defined as any user whose user classification is identified in the Standard Industrial Classifications (SIC) Manual in any of Divisions A, B, D, E, and I and who (1) has a discharge flow of 50,000 gallons or more per average work day or (2) has a flow greater than 5% of the flow in the wastewater treatment system, or (3) has in his wastes toxic pollutants in toxic amounts as defined in standards issued under Section 307(a) of the Federal Act, or (4) is found by the Agency to have significant impact, either singly or in combination with other contributing industries, on the treatment or collection system.

4.02.2 Users seeking authorization shall complete and file with the Director, an application in the form prescribed by the Director. The applicant may be required to submit, in units and terms appropriate for evaluation, the following information:

a. Name, address, and SIC number of applicant;

b. Volume of wastewater to be discharged;

c. Wastewater constituents and characteristics including but not limited to those mentioned in Section 2.08 as determined by a laboratory approved by the Agency.

d. Time and duration of discharge;

e. Average and 30 minute peak wastewater flow rates, including daily, monthly and seasonal variations if any;

f. Site plans, floor plans, mechanical and plumbing plans and details to show all sewers and appurtenances by size, location and elevation.

g. Description of activities, facilities and plant process on the premises including all materials, processes and types of materials which are or could be discharged;

h. Each product produced by type, amount, and rate of production;

i. Number and type of employees and hours of work;

j. Any other information as may be deemed by the Director to be necessary to evaluate the permit application.

The Director will evaluate the data furnished by the user and may require additional information. After evaluation and acceptance of the data furnished, the Director may issue Wastewater Discharge Authorization subject to terms and conditions provided herein.

4.02.3 An authorization for Wastewater Discharge shall be expressly subject to all provisions of this ordinance and all other regulations, user charges and fees established by the Agency. The conditions of authorization shall be uniformly enforced by the Director in accordance with this ordinance, and applicable state and federal regulations. Authorization may contain the following:

a. The unit charge or schedule of user charges and fees for the wastewater to be discharged to a community sewer;

b. The average and maximum wastewater constituents and characteristics;

c. Limits on rate and time of discharge of requirements for flow regulations and equilization;

d. Requirements for installation of inspection and sampling facilities;

e. Pre-treatment requirements;

f. Specifications for monitoring programs which may include sampling locations, frequency and method of sampling, number, types and standards for tests and reporting schedule;

g. Requirements for submission of technical reports or discharge reports;

h. Requirements for maintaining plant records relating to wastewater discharge as specified by the Agency and affording Agency access thereto;

i. Mean and maximum mass emission rates, or other appropriate limits when incompatible pollutants (as defined by section 1.021) are proposed or present in the user's wastewater discharge.

j. Other conditions as deemed appropriate by the Agency to insure compliance with this Ordinance.

4.02.4 Duration of Authorization. Authorization shall be issued for an unlimited time period. A temporary authorization shall be issued for a specified duration. The terms and conditions of the authorization shall be subject to modification and change by the Agency during the life of the authorization as limitations or requirements as identified in section 2.08 are modified and changed. The user shall be informed of any proposed changes in his authorization at least 60 days prior to the effective date of change. Any changes or new conditions in the authorization shall include a reasonable time schedule for compliance.

4.02.5 Transfer of an Authorization. A Wastewater Discharge Authorization shall not be reassigned or transferred or sold to a new owner, new user, different premises, or a new or changed operation.

4.02.6 Revocation of Authorization. Any user who violates the following conditions of the authorization of this ordinance, or applicable state and federal regulations is subject to having his authorization revoked;

a. Failure of user to factually report the wastewater constituents and characteristics of his discharge;

b. Failure of the user to report significant changes in operations, or wastewater constituents and characteristics;

c. Refusal of reasonable access to the user's premises for the purpose of inspection or monitoring; or

d. Violation of conditions of the authorization.

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4.03 Monitoring Facilities. The Agency may require the user to construct at his own expense, monitoring facilities to allow inspection, sampling, and flow measurement of the building sewer or internal drainage systems and may also require sampling or metering equipment to be provided, installed, and operated at the user's expense if the provisions of Sections 2.01, 2.04, 2.05, 2.07, or 2.08 may be violated. The monitoring facility should normally be situated on the user's premises, but the Agency may, when such a location would be impractical or cause undue hardship on the user, allow the facility to be constructed in the public street or sidewalk area and located so that it will not be obstructed by landscaping or parked vehicles.

If the monitoring facility is inside the user's property, there shall be accomodations to allow access for Agency personnel. There shall be ample room in or near such sampling manhole to allow accurate sampling and compositing of samples for analysis. The manhole, sampling and measuring equipment shall be maintained at all times in a safe and proper operating condition at the expense of the user.

Whether constructed on public or private property, the sampling and monitoring facilities shall be provided in accordance with the Agency's requirements and all applicable local Agency construction standards and specifications. Construction shall be completed within a reasonable period of time following written notification by the Agency.

4.04 Inspection and Sampling. The Agency may inspect the facilities of any user to ascertain whether the purpose of this ordinance is being met and all requirements are being compiled with. Persons or occupants of premises where wastewater is created or discharged shall allow the Agency or its representative ready access at all reasonable times to all parts of the premises for the purposes of inspection or sampling or in the performance of any of their duties. The Agency shall have the right to set up on the user's property such devices as are necessary to conduct sampling or metering operations. Where a user has security clearance before entry into their premises, the user shall make necessary arrangements with their security guards so that upon presentation of suitable identification, personnel from the Agency will be permitted to enter without delay for the purposes of performing their specific responsibilities.

4.05 Pre-treatment. Users shall make wastewater acceptable under the limitations established herein before discharging to any community sewer. Any facilities required to pre-treat wastewater to a level acceptable to the Agency shall be provided and maintained at the user's expense. Detailed plans showing the pre-treatment facilities and operating procedures shall be submitted to the Agency before construction of the facility. The review of such plans and operating procedures will in no way relieve the user from the responsibility of modifying the facility as necessary to produce an effluent acceptable to the Agency under the provisions of this ordinance. The Agency shall be notified 48 hours prior to start up of new or modified pre-treatment facilities Any subsequent changes in the pre-treatment facilities or method of operation shall be reported to and be acceptable to the Agency.

4.06 Protection from Accidental Discharge. Each user shall provide protection from accidental discharge of prohibited materials or other wastes regulated by this ordinance. Such facilities shall be provided and maintained at the user's expense. Detailed plans showing facilities and operating procedures to provide this protection shall be submitted to the Agency for review, and shall be acceptable to the Agency before construction of the facility.

The review of such plans and operating procedures will in no way relieve the user from the responsibility of modifying the facility as necessary to provide the protection necessary to meet the requirements of this section. In the event of an accidental discharge to the Sanitary Sewer the Agency shall be notified immediatley.

4.07 Confidential Information. All information and data on a user obtained from reports, questionnaires, permit application, permits and monitoring programs and from inspections shall be available to the public or other governmental agency without restriction unless the user specifically requests and is able to demonstrate to the satisfaction of the Agency that the release of such information would divulge information, processes or methods which are of a proprietary nature to the user's competitive position.

When requested by the person furnishing a report, the portions of a report which might disclose trade secrets or secret processes shall not be made available for inspection by the public but shall be made available to governmental agencies for use in making studies; provided, however, that such portions of a report shall be available for use by the state or any state agency in judicial review or enforcement proceedings involving the person furnishing the report. Wastewater constituents and characteristics will not be recognized as confidential information. Information accepted by the Agency as confidential, shall not be transmitted to any governmental agency or to the general public by the Agency until and unless prior and adequate notification is given to the user.

4.08 Special Agreements. Special agreements and arrangements between the Agency and any persons or agencies may be established when in the opinion of the Agency unusual or extraordinary circumstances compel special terms and conditions.

Chapter 5

USER CHARGES FOR EXCESS STRENGTH OF WASTE

5.01 Adjustment of Charges Based on Strength & Character of Sewage. Each person, partnership, corporation, business or industry discharging wastes into the Sanitary District sewers shall be subject to a surcharge in addition to the regular sewage service charge based on the biochemical oxygen demand (BOD) and the suspended solids (SS) content of the wastes, if the wastes have a concentration higher than 250 ppm of BOD and/or 250 ppm of SS.

a. Biochemical oxygen demand - 250 ppm

b. Suspended solids - 250 ppm

5.01.1 Sampling and testing for surcharges or user charges. The discharge sewage will be sampled during each sewage billing period for minimum of a one day period (24 continuous hours) by means of a composite sample. An extended sampling period of up to one week (7 continuous days) or reduction may be requested to enable the gathering of a sample representative of a business' sewage. The extension or reduction of the sampling period beyond the initial one day sampling period may be requested by either the sewer user involved or the Muncie Sanitary District. If an extended sampling period is requested, the parameter values used to calculate the surcharge will be the arithmetical average of the individual values. In the event a business or industry has multiple discharges of sewage, each discharge shall be sampled according to quality. The volume of each discharge shall be determined by actual measurement or by means of process usage. If significant process changes are made to affect quality of any discharge, resampling may be requested by either the sewer user involved or the Muncie Sanitary District.

The sewage sample shall be measured for the following parameters: Biochemical oxygen demand (BOD) and suspended matter or solids (SS). These tests shall be made in accordance with the latest editions of *Standard Methods for the Examination of Water and Wastewater* by APHA, WPCF or *Methods for Chemical Analysis of Water and Waste* by the United States Environmental Protection Agency.

5.01.2 Computation of surcharge: The excess pounds of BOD and of suspended solids will each be computed by multiplying the sewage billing volume measured in units of 100 cubic feet for the current sewage billing period by the factor 0.006238 and then multiplying the difference between the concentration measured in milligrams per liter of the BOD and of the suspended solids, respectively, in the customer's sewage and the allowed concentrations set out above and in Section 5.01 (A) and (B), resulting in the pounds of each constituent. The surcharge of each constituent will then be determined by multiplying the excess pounds of each constituent by the appropriate rate of surcharge.

Chapter 6

ENFORCEMENT

The Director of the Division of Water Quality shall be the authorized agent for the Muncie Sanitary District to insure that the provisions of this ordinance are carried out.

6.01 Accidental Discharge.

6.01.1 Notification of Discharge. Users shall notify the Agency immediately upon accidentally discharging wastes in violation of this ordinance to enable counter measures to be taken by the Agency to minimize damage to the community sewer, treatment facility, treatment processes and the receiving waters.

This notification shall be followed, within 15 days of the date of occurance, by a detailed written statement describing the causes of the accidental discharge and the measures being taken to prevent future occurrence.

Such notification will not relieve users of liability for any expense, loss or damage to the sewer system, treatment plant, or treatment process or for any fines imposed on the Agency.

6.02 Issuance of Cease and Desist Orders. When the Agency finds that a discharge of wastewater has taken place, in violation of prohibitions or limitations of this ordinance, the Director may issue an order to cease and desist and direct that those persons not complying with such prohibitions, limits, requirements or provisions to:

a. Comply forthwith;

b. Comply in accordance with a time schedule set forth by the Agency, or

c. Take appropriate remedial or preventive action in the event of a threatened violation.

6.03 Submission of Time Schedule. When the Agency finds that a discharge of wastewater has been taking place, in violation of prohibitions or limitations prescribed in this ordinance, or wastewater source control requirements, effluent limitations or pre-treatment standards, or the provisions of a Wastewater Discharge Authorization, the Agency may require the user to submit for approval, with such modifications as it deems necessary, a detailed time schedule for specific actions which the user shall take in order to prevent or correct a violation of requirements.

6.04 Appeals. Any user affected by any decision, action or determination, including Cease and Desist Orders, made by the Director, interpreting or implementing the provisions of this ordinance or in any authorization issued herein, may file with the Director a written request for reconsideration within 10 days of such decision, action, or determination, setting forth in detail the facts supporting the user's request for reconsideration.

If the ruling made by the Director is unsatisfactory to the person requesting reconsideration, he may within 10 days after notification of Agency action, file a written appeal to the General Manager of the Muncie Sanitary District. If the ruling made by the General Manager is unsatisfactory to the person requesting reconsideration, he may within 10 days after notification of Agency action, file a written appeal to the Board of Sanitary Commissioners. The written appeal shall be heard by the body within 30 days from the date of filing. The Agency's governing body shall make a final ruling on the appeal within 10 days of the close of the meeting. The Director's decision, action, or determination shall remain in effect during such period of reconsideration.

Chapter 7

ABATEMENT

7.01 Public Nuisance. Discharges of wastewater in any manner in violation of this ordinance or of any order issued by the Director as authorized by this ordinance, is hereby declared a public nuisance and shall be corrected or abated as directed by the Director. Any person creating a public nuisance is guilty of a misdemeanor.

7.02 Injunction. Whenever a discharge of wastewater is in violation of the provisions of this ordinance or otherwise causes or threatens to cause a condition of contamination, pollution or nuisance, the Agency may petition any court of competent jurisdiction for the issuance of a preliminary or permanent injunction or both, as may be appropriate in restraining the continuance of such discharge.

7.03 Damage to Facilities. When a discharge of wastes causes an obstruction, damage, or any other impairment to Agency facilities, the Agency may assess a charge against the user for the work required to clean or repair the facility and add such charge to the user's charges and fees.

7.04 Criminal Penalties. Any person who intentionally or negligently violates any provision of this ordinance or Authorization condition or who discharges wastewater which causes pollution or who violates any cease and desist order, prohibition, effluent limitation, or pre-treatment standard shall upon conviction be punished by a fine not exceeding $1,000 or by imprisonment not exceeding six (6) months, or both. Every day any violation of such ordinance shall continue shall constitute a separate offense.

7.05 Falsifying of Information. Any person who knowingly makes any false statement or representation, record, report, plan or other documents filed with the Agency or who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required under this ordinance, upon conviction, shall be punished by a fine of not more than $1,000.

7.06 Termination of Service. The Agency may revoke any Wastewater Discharge Authorization, or terminate or cause to be terminated wastewater service to any premise if a violation of any provision of this ordinance is found to exist or if a discharge of wastewater causes or threatens to cause a condition of contamination, pollution, or nuisance as defined in this ordinance. This provision is in addition to other statutes, rules, or regulations, authorizing termination of service for delinquency in payment.

Chapter 8

SEVERABILITY

If any provision of these regulations or the application to any person or circumstances is held invalid, the remainder of the regulations or the application of such provisions to other persons or other circumstances shall not be affected.

Board of Sanitary Commissioners By	Joseph Neff,
(signed by Claude Becktell	and Herbert E. Schuch)

APPENDIX B

INDUSTRIAL COST RECOVERY AND RATE ORDINANCE

CONFIRMING RESOLUTION

WHEREAS, the Board of Sanitary Commissioners of the Muncie Sanitary District of the City of Muncie, Indiana considered and approved a preliminary resolution dated the 14th day of June, 1976, fixing a new schedule of rates and charges to be collected by the Muncie Sanitary District of the City of Muncie, Indiana.

WHEREAS, the Board of Sanitary Commissioners of the Muncie Sanitary District of the City of Muncie, Indiana caused to be published a notice of the time and place of a public hearing on said resolution, proof of said publication is attached hereto and by reference made a part hereof showing that said publication was made in the Muncie Star, a newspaper of general circulation within the Muncie Sanitary District on the 14th day of June, 1976, said publication being more than ten days prior to June 24, 1976, as evidenced by the notice and affidavit which are attached hereto and by reference made a part hereof.

WHEREAS, the Board of Sanitary Commissioners of the Muncie Sanitary District of the City of Muncie, Indiana thereupon examined the preliminary resolution fixing a new schedule of rates and charges to be collected by the Muncie Sanitary District, city of Muncie, Indiana thereupon examined the preliminary resolution fixing a new schedule of rates and charges to be collected by the Muncie Sanitary District, city of Muncie, Indiana, as adopted on June 24, 1976, as well as the pertinent notices and proof thereof of the time and place or hearing thereon and now finds:

1. That the preliminary resolution fixing a new schedule of rates and charges to be collected by the Muncie Sanitary District of the City of Muncie, Indiana, as adopted on June 24, 1976, was duly adopted on June 24, 1976;

2. That due notice of the time and place of public hearing on said resolution was given as required by law;

3. That a public hearing was held and all comments and objections to the said fixing of a new schedule of rates and charges as set forth in the preliminary resolution were heard and duly considered by the Board;

4. That such preliminary resolution fixing a new schedule of rates and charges is amended and is now ready for submission to the Board and for consideration and action thereon by the Board.

IT IS THEREFORE ORDERED, ADJUDGED AND RESOLVED BY THE BOARD:

1. That the resolution of the Board of Sanitary Commissioners of the Muncie Sanitary District of the City of Muncie, Indiana, fixing a new schedule of rates and charges to be collected by the Muncie Sanitary District, as adopted on June 24, 1976, be amended after public hearing and as amended is hereby ratified and confirmed and reads in its entirity as follows, and is worded for convenience in the form of two (2) Parts A and B:

PART A

THIS PART ESTABLISHED RATES AND CHARGES FOR THE TREATMENT OF SEWAGE IN AND FOR THE SANITARY DISTRICT OF THE CITY OF MUNCIE, INDIANA

WHEREAS, The Sanitary District of the City of Muncie, Indiana has authorized construction of additional interceptor sewers and advanced waste treatment plant additions, which shall be funded in part by federal and state construction grants; and,

WHEREAS, it is necessary to establish a new schedule of rates and charges so as to produce sufficient revenue to pay operation and maintenance costs, to pay the principal and interest on outstanding revenue bonds, and to provide funds for necessary replacements and improvements to the sewage works, all in a manner in accordance with guidelines of the U.S. Environmental Protection Agency; now therefore

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MUNCIE, INDIANA, AS FOLLOWS:

SECTION 1: Unless the context specifically indicates otherwise, the meaning of terms used in this Ordinance shall be as follows:

(a) "Operation and maintenance costs" shall mean the expenditures for day-to-day operating costs (which includes wages, supplies, fuel, insurance, services, etc.) plus the costs of normal repairs, routine maintenance, and replacements of plant and equipment.

(b) "Replacement costs" shall mean the expenditures for obtaining and installing equipment, accessories for appurtenances which are necessary during the service life of the treatment works to maintain the capacity and performance for which such works were designed and constructed.

(c) "Useful or service life" shall mean a period of 15 years for equipment, 50 years for treatment plant structures and 100 years for public sewers.

(d) "Depreciation of real property" shall mean a system of expense accounting which aims to distribute the original cost of real property over the useful life of the property.

(e) "Normal strength sewage" (for the purpose of determining industrial surcharges) shall mean wastewater or sewage having an average dialy suspended solids concentration of not more than 250 mg/1 and average dialy BOD requirements or not more than 250 mg/1.

(f) "Sewer Industrial Cost Recovery Ordinance" shall mean a separate and companion enactment to this Ordinance, which provides for recovery from industrual users of the sewage works of a portion of the federal grant amount allocable to the construction of sewage facilities for treating industrial waste pursuant to Section 204(b) of PL 92-500 and 40 CFT Part 35.928 (1) and (2). The amount of the federal grant for the construction of facilities to treat industrial waste represents a recoverable loan to be repaid by industrial users.

(g) "BOD (denoting Biochemical Oxygen Demand) and suspended solids" shall have the same meaning as defined in the Sewer User Ordinance.

(h) "Sewer Use Ordinance" shall mean a separate and companion enactment to this Ordinance, which regulated the connection to and use of public and private sewers.

(i) "Classes of Users," for the purpose of "user charges" (as defined) shall mean the division of wastewater treatment customers by waste characteristics, and process of discharge similarities.

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Residential class shall be confined to those customers whose wastes originate from residential domestic activities and the strength of such wastes does not exceed normal strength limitations, as defined.

Commercial class shall be confined to those customers involved in a commercial enterprise, business or service whose wastes originate from sanitation activities and the strength of such wastes does not exceed normal strength limitations, as defined.

Institutional class shall be confined to those customers involved in social, charitable, religious, educational or other special purpose activities whose wastes originate from sanitation activities and the strength of such wastes does not exceed normal strength limitations, as defined.

Governmental class shall be confined to those customers involved in federal, state or local government activities whose wastes originate from sanitation activities and the strength of such wastes does not exceed normal strength limitations, as defined.

Industrial class shall include all customers involved in manufacturing or processing activities and all other customers whose wastes originate from activities other than sanitation activities.

(j) "User Charge" shall mean a charge levied on users of the wastewater treatment works for the costs of operation and maintenance of such works pursuant to Section 204(b) of Public Law 92-500.

(k) "Debt service costs" shall mean the annual principal and interest payments on all outstanding revenue bonds or other long-term capital debt.

(l) "Excessive strength surcharges" shall mean an additional charge which is billed to users for treating sewage wastes with an average strength in excess of "normal strength sewage."

(m) "Other service charges" shall mean tap charges, connection charges, area charges, debt service charges and excessive strength surcharges.

(n) "Uniform quantity treatment charge" shall mean that portion of the user charge to recover operation and maintenance costs for treating influents received at the treatment plant as a result of measured flow from all users of the sewage treatment works. The "uniform quantity treatment charge" is the same for all users.

(o) "Infiltration/inflow treatment charge" shall mean that portion of the user charge to recover the operation and maintenance costs for treating influents received at the treatment plant as a result of infiltration/ inflow which is apportioned to the various user classes.

(p) "Sewer, billing and debt service charges" shall mean that portion of the rate charge to recover sewer maintenance costs, billing and collecting costs, and debt service costs which are apportioned to the various user classes.

(q) "Sewage" shall mean the combination of the liquid and water-carried wastes from residences, commercial buildings, industrual plants and institutions (including polluted cooling water).

The three (3) most common types of sewage are:

Sanitary sewage shall mean the combination of liquid and water carried wastes discharged from toilet and other sanitary plumbing facilities.

Industrial sewage shall mean a combination of liquid and water carried wastess discharged from any industrial establishment, and resulting from any trade or process carried on in that establishment (this shall include the wastes from pretreatment facilities and polluted cooling water).

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Combined sewage shall mean wastes including sanitary sewage, industrial sewage, stormwater, infiltration and inflow carried to the wastewater treatment facilities by a combined sewer.

(r) "NPDES (National Pollutant Discharge Elimination System) Permit" shall have the same meaning as defined in the Sewer Use Ordinance.

(s) "District" shall mean the Sanitary District of the City of Muncie, Indiana.

(t) "Shall" is mandatory; "May" is permissive.

SECTION 2: Every person whose premises are served by said sewage works shall be charged for the services provided. These charges are established for each user class, as defined, in order that the sewage works shall recover, from each user and user class, revenue which is proportional to its use of the treatment works in terms of volume and load. User charges are levied to defray the cost of operation and maintenance (including replacement) of the treatment works. User charges shall be uniform in magnitude within a user class.

(a) User charges are subject to the rules and regulations adopted by the United States Environmental Protection Agency, published in the Federal Register August 21, 1973 (38 CFR 22523) and on February 11, 1974 (39 CFR 5252). Replacement costs, which are covered through the system of user charges, shall be based upon the expected service life of the sewage works structures and equipment.

(b) The various classes of users of the treatment works for the purposes of this Ordinance, shall be as follows:

Class I - Residential and commercial

Class II - Institutional, governmental and industrial

PART B

THIS PART PROVIDES FOR THE ESTABLISHMENT OF AN INDUSTRIAL COST RECOVER SYSTEM, TO RECOVER FROM INDUSTRIAL USERS OF THE SANITARY DISTRICT OF THE CITY OF MUNCIE THAT PORTION OF THE FEDERAL GRANT, ALLOCABLE TO INDUSTRIAL USERS, FOR THE CONSTRUCTION OF THE SANITARY DISTRICT WASTE WATER TREATMENT FACILITIES.

WHEREAS, The Sanitary District of the City of Muncie has received federal grants for the construction of waste water treatment facilities which are identified by the U.S. Environmental Protection Agency as Project Number C-180547 and Project Number C-180532 02; and,

WHEREAS, in order to comply with special grant conditions under Public Law 92-500, which requires the District to recover from industrial users of the waste water treatment facilities, that portion of the grant amount allocable to the treatment of industrial wastes; and,

WHEREAS, the District must establish a system of industrial cost recovery based upon federal guidelines; now therefore,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MUNCIE, INDIANA AS FOLLOWS:

SECTION 1: Unless the context specifically indicates otherwise, the meaning of terms used in this Ordinance shall be as follows:

(a) "Industrial user" shall mean any non-governmental user of the treatment works identified in the Standard Industrial Classification Manual, 1972, Office of Management and Budget, as amended and supplemented, under the following divisions:

-1- Division A - Agriculture, Forestry & Fishing

-2- Division B - Mining

-3- Division D - Manufacturing

-4- Division E - Transportation, Communication, Electric, Gas & Sanitary Services

-5- Division I - Services

A user in the divisions listed may be excluded if it is determined that such user will introduce primarily segregated domestic wastes or wastes from sanitary conveniences. It is noted that the classification of users for the purpose of this Ordinance is not identical to the classification of users defined in Part A (Rate Ordinance). For the purpose of this Ordinance there are two (2) separate user classes: (1) Industrial and (2) Non-industrial. Part A (Rate Ordinance) defines five (5) separate user classes which are identified as (1) Residential, (2) Commercial, (3) Institutional, (4) Governmental and (5) Industrial.

(b) "Segregated Domestic Wastes" shall mean wastes from non-residential sources, resulting from normal domestic activities and measurable and set apart from industrial trade or process discharges.

(c) "Normal domestic wastes" shall mean wastes which do not exceed a Biochemical Oxygen Demand requirement of 250 milligrams per liter of fluid, or a suspended solids strength in excess of 250 milligrams per liter of fluid. However, normal domestic wastes shall not include any wastes which originate from an industrial user, as defined in Section 1 (a), above.

(d) "Non-industrial user" shall mean any governmental or residential user. The term also includes commercial, institutional and other industrial users where it has been determined that the wastes contributed by these users is primarily segregated domestic wastes or wastes from sanitary conveniences.

(e) "Recovered amounts" shall mean the annual payments from industrial users for their share of the federal grant allocable to the cost of treating industrial waste, which is determined by dividing the amount of the total federal grant, allocable to the treatment of industrial waste, by the recovery period.

(f) "Recovery period" shall mean the industrial cost recovery period, which is hereby defined as a period of thirty years.

(g) "Projects C-180547 and C-180532 02" are defined as separate and distinct construction projects for construction of additions to the waste water treatment facilities of the Sanitary District of the City of Muncie which were sponsored by the U.S. Environmental Protection Agency under the provisions of Public Law 92-500. These projects do not include past or future construction, equipment or other services not included under the specific project numbers and the approved plans, specifications and approved change orders for the projects, which are on file within the District, and by reference made a part of this Ordinance as fully as if same were attached hereto or incorporated herein.

(h) "Federal grant amounts" shall mean that portion of the total construction costs for Projects C-180547 and C-180532 02 which were sponsored by the U.S. Environmental Protection Agency.

Total construction costs for Project C-180547 will amoung to approximately $10,586,855, the federal grant will amount to approximately $7,047,225. Total construction costs for Project C-180532 02 will amount to approximately $7,380,840, the federal grant will amount to approximately $5,245,543.

(i) "Retained amounts" shall mean that portion of the recovered amounts retained by the District. The retained amounts shall be equal to 50% of the recovered amounts, together with interest earned thereon.

(j) "Payment to U.S. Treasury" shall mean that portion of the recovered amounts that must be returned to the U.S. Treasury on an annual basis. The annual payments to the U.S. Treasury shall amount to 50% of the annual recovered amounts, together with interest earned thereon.

(k) "Amounts for reconstruction and expansion" shall mean those amounts which represent a minimum of 80% of the amount retained by the District, together with interest earned thereon. These amounts shall be used solely for reconstruction and expansion of waste treatment facilities which must be approved by the U.S. Environmental Protection Agency. The remaining 20% of retained amounts may be used at the discretion of the District.

SECTION 2: In order to comply with federal regulations, in the case of federal grant assistance for the construction of waste treatment works, where it has been determined that "industrial users" as defined in Section 1, above, or as amended by appropriate federal regulations, are required to reimburse a portion of the federal grant amount allocable to the capital cost of constructing facilities for the treatment of "industrial wastes," rates and charges shall be collected from each industrial user connected to the sewage works or who otherwise discharges sewage, water or liquids, either directly or indirectly, into the waste treatment system, which charges shall be payable as hereinafter provided and shall be in an amount determinable as follows:

(a) The industrial cost recovery charges for the treatment of industrial wastes shall be based upon the volume of sewage flow billed to industrial users, as determined in accordance with appropriate provisions for determining billed flow included in Part A (Rate Ordinance) and the total strength and character of industrial wastes which are introduced into the waste treatment system. The owner or industrial user shall furnish a central sampling point available to the District at all times. The industrial cost recover rates for the treatment of wastes shall be as follows:

-1- Project C-180547 (North Area interceptor sewer additions)

(a) The industrial cost recover charges applicable to Project C-180547 shall be recovered from present or future industrial users who will be connected to that segment of the collection system directly served by the interceptor sewer additions identified with Project C-180547.

(b) Measurement and rate:	Rate per 100 cu. ft.
Monthly volume flow, which includes normal domestic wastes (BOD 250 mg/1 and suspended solids 250 mg/1).	$.024

-2- Project C-180532 02 (Advanced waste treatment plant additions)

(a) The industrial cost recovery charges applicable to Project C-180532 02 shall be recovered from all present or future industrial users who are serviced by the Sanitary District of the City of Muncie.

(b) Measurement and rates:

Monthly volume flow, which includes normal domestic wastes (BOD 250 mg/l and suspended solids 250 mg/1)	$.0149 per
Monthly pounds of suspended in excess of 2500 mg/l	$.0057 per 1

(b) However, in the event an "industrial user" can and does show to the satisfaction of the District that a portion of the total monthly billed sewage flow is from sanitary conveniences, then the flow and pollutant loadings to which the industrial cost recovery charge is applied, shall be determined on the basis of net flow and pollutant loadings excluding wastes from sanitary conveniences.

(c) The industrial cost recovery charges for treatment services on or after the effective dates as stated in Section 7 shall be prepared and billed annually.

SECTION 3: The District shall determine which users are subject to paying the industrial cost recovery charges, in the following manner:

(a) The District shall require appropriate employees of the Sanitary District to review appropriate records and prepare a list of all potential industrial users, as identified in each of the Divisions listed in Section 1(a) above.

(b) The list of all potential industrial users shall be analyzed on the basis of available data (i.e. type of business, volume charges, excessive loading charges, estimated number of employees, etc.) for the purpose of developing preliminary lists of probably "industrial" and probably "non-industrial" users.

(c) The District shall conduct an immediate survey of all probably "industrial" users in order to substantiate the validity of classifying user as an "industrial" user. Each user initially classified as an "industrial" user, shall be notified as to their classification.

(d) After completing the survey of all probable "industrial" users, the District shall review the list of probably "non-industrial" users to determine if the initial classification of any of these users should be reconsidered. Where appropriate, individual users will be contacted in order to determine the proper classification.

(e) After an industrial user has been notified of his classification, the user may request reconsideration by furnishing data and measurements acceptable to the District for the determination of sewage discharges. The District shall have the right to measure and determine the strength and content of all sewage and waste discharges, either directly or indirectly into the District's sanitary sewage system, in such manner and by such method as it may deem practicable in the light of the conditions and attending circumstances of each case in order to determine the proper use classification.

(f) Within a reasonable period of time following completion of the construction projects, as defined, the District shall have completed the initial classification of all industrial users. During the first calendar year of operation, subsequent to completion of the construction projects, and annually thereafter, the District shall review, classify and reclassify all users as either industrial or non-industrial users based upon measurements and data obtained by the District or furnished by individual users. Normally, each user will retain his classification until the next succeeding classification period. However, if there is a substantial change in strength, volume or delivery flow rate characteristics introduced into the treatment works by an individual user, then the classification of that user may be review and established during the year in light of the conditions and attending circumstances of each case.

(g) An industrial user who discontinues use of the treatment works is not subject to industrial cost recovery payments, beyond the period of use.

(h) Industrial users who commence to use the treatment works at some future date are not subject to industrial cost recover charges before the period of use.

(i) The industrial cost recovery charges in Section 2 above, do not include any interest component.

SECTION 4: The basis for the industrial cost recovery rates and charges included in Section 2 above, are as follows:

(a) Project C-180547 (North Area interceptor sewer additions):

(1) Total estimated federal grant amount to be awarded for construction of additions under Project C-180547 amounts to approximately $7,047,225.

(2) Average annual basis for industrial cost recovery charges amount to $234,908 ($7,047,225 federal grant, divided by 30 year recovery period).

(3) Design capacity:

(a) Annual treatment plant capacity - 975,870,596 cubic feet (20MGD × 365 days ÷ 7.4805 cubic feet)

(b) Design capacity of total sewerage system - 2,927,611,788 cubic feet (975,870,596 cubic feet, plant capacity × average peak design factor of 3)

(4) Cost recovery rate:

$234,908 (Annual cost) ÷ 2,927,611,788 cubic feet (design capacity) = $.024 per 100 cubic feet

(5) The rate computed in subsection (d) above, would result in total recovery of the federal grant amount if all users were subject to the industrial cost recovery requirement, and provided that the design capacity of the sewerage system was fully utilized during the cost recovery period. Therefore, there rates will insure that each industrial user subject to the charges will pay only that portion of the federal grant amount applicable to the costs of the sewerage facilities actually utilized to treat industrial wastes, as determined by each industrial users measured flow.

(b) Project C-180532 02 (advanced waste treatment plant additions):

(1) Total estimated federal grant amount to be awarded for the construction of additions to the waste water treatment plant under Project C-180532 02 will amount to approximately $5,245,543.

(2) The consulting engineers estimate that an equitable distribution on a percentage basis of the total cost of construction and equipment included in the project will be as follows:

-a-	Treatment of sanitary waste flow	40%
-b-	Treatment of suspended solids	30%

(3) The design capacity of the treatment plant after completion of the project, as defined, will be as follows:

-a- Flow: Average daily flow 24MGD times 365 days divided by design flow capacity.

-b- Suspended solids: Practical capacity 250 mg/1, times annual in 18,249,268 pounds average annual design capacity.

(4) Industrial cost recovery period will be 30 years.

(5) Average annual basis for the cost recovery charge will amount to $174,851 ($5,245,543 federal grant, divided by 30 years recovery period).

(6) Total annual basis for the cost recovery charge allocated to treatment functions is as follows:

-a- Treatment of waste volume ($174,851 × 40%) = $69,940

-b- Treatment of suspended solids ($174,851 × 60%) = $104,911

(7) The industrial cost recovery rates for the treatment charges are computed on the basis of the annual functional costs of treatment, divided by average annual design capacity in the following manner:

-a- Treatment of sanitary waste volume:
(Annual functional cost) $69,941 divided by annual capacity 1,171,044,716 CF equals $.0060 per 100 cubic feet

-b- Treatment of suspended solids:
(Annual functional cost $104,911) divided by annual capacity 18,249,268 pounds equals $.0057 per pound.

(8) The rates computed in subsection (A) above, would result in total recovery of the federal grant amount if all users were subject to the industrial cost recovery requirement, and provided that the treatment plant was operated at capacity during the cost recovery period. Therefore, these rates will insure that each industrial user will pay only that portion of the federal grant amount applicable to the costs of the treatment facilities actually utilized to treat industrial wastes, as determined by such industrial users flow and pollutant loadings.

SECTION 5: The District shall account for all industrial cost recovery payments in the following manner:

(a) All revenues derived from the industrial cost recovery rates and charges shall be segregated and kept in a special fund, separate and apart from all other funds of the City of Muncie. The special fund shall be designated the "Sanitary District Industrial Cost Recovery Fund" and payment of said amount into said fund shall be deemed a reasonable expense of operation of the sewage works for the purpose of computing net operating revenue.

(b) Within 45 days following the end of the first calendar year after completion of the construction projects, as defined, and annually thereafter, the District shall return fifty percent (50%) of the amounts recovered through the industrial cost recovery charges, together with any interest earned thereon, to the U.S. Treasury. The remaining fifty percent (50%) retained by the District shall be invested in authorized obligations of the U.S. Government or any agency thereof.

• (c) Eighty percent (80%) of the funds retained by the District in the "Sanitary District Industrial Cost Recovery Fund" or authorized investments and the interest earned thereon, shall be expended only for the purpose of eligible costs of expansion or reconstruction of the treatment works. All such expansion or reconstruction programs must be approved by the U.S. Environmental Protection Agency prior to commitment of expenditure of the retained funds. The remaining twenty percent (20%) of the funds retained by the District may be utilized for any authorized use associated with the sewage works.

SECTION 6: Upon request from EPA, the District shall encourage each industrial user to permit representatives of U.S. Environmental Protection Agency to review appropriate industrial sewage records for the purpose of independently verifying the flow and characteristics of industrial wastes which are introduced into the treatment works. No waste introduced into the waste treatment system shall interfere with the operation or performance of the sewage treatment works. All users are subject to the requirements of pretreatment standards established by federal and state law.

SECTION 7: The industrial cost recovery rates and charges shall be prepared, billed and collected in the manner provided by law and ordinance. The industrial cost recovery charges shall become effective for services rendered during the first calendar month following completion of each of the construction projects, as defined, and shall be prepared and billed monthly.

SECTION 8: This ordinance shall be in full force and effect from and after its passage.

Adopted this 24th day of June, 1976.

MUNCIE SANITARY DISTRICT, CITY OF MUNCIE,
INDIANA
BOARD OF SANITARY COMMISSIONERS BY:

(Signed by: Claude Becktell

Joseph Neff

Herbert E. Schuch)

APPENDIX C

MUNCIE INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ____________________

POSITION TITLE: Director

DEPARTMENT: Division of Water Quality

DIVISION: Administration

INTRODUCTION:

This position is responsible for supervision, coordination and management of the Division of Water Quality.

DUTIES AND RESPONSIBILITIES:

Incumbent supervises, coordinates and manages all activities of the Division of Water Quality.

Works with industry to correct Industrial water pollution problems. Presides over the Muncie Industrial Clean Water and Waste Management Council. Receives, reviews and complies with Environmental Protection Agency guidelines. Meets federal and state revenue grant requirements in Industrial and Municipal Waste Control.

Enforces federal, state and district Water Pollution Control laws. Institutes legal actions and if necessary writes new laws concerning water problems.

Prepares and submits the Division of Water Quality budget. Prepares and submits yearly reports to the Indiana State Board of Health. Responsible for the dissemination of information to the public media. Attends management staff meetings and occasionally attends constructive workshops.

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Establishes work policies and procedures for the Division of Water Quality. Responsible for placement of all Water Quality personnel. If necessary, may discharge personnel.

Purchases supplies and reviews all supply purchase requests. Evaluates and institutes new testing procedures.

Makes decisions concerning testing frequencies and new testing set-up procedures.

CONTROLS OVER POSITION:

Responsible to the Board of Sanitary Commissioners.

Position is subject to 24 hour emergency call.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in one of the Environmental Sciences. Must have some management and supervisory experience.

Must have a general working knowledge of Federal, State and District laws concerning water pollution control. Must have knowledge of laboratory equipment and testing methods. Should have a working knowledge of industrial pre-treatment techniques.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________

POSITION TITLE: Administrative Assistant

DEPARTMENT: Division of Water Quality

DIVISION: Administration

INTRODUCTION:

This position is responsible for various office, computer and clerical duties plus assisting in the coordination of various Division activities.

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DUTIES AND RESPONSIBILITIES:

Incumbent performs various office clerical duties. Examples include: scheduling appointments, giving information to callers, reading and routing incoming mail, routing of complaints from the public on water pollution to appropriate personnel, locates and attaches appropriate file to correspondence to be answered, files correspondence and other records, greets visitors, ascertains nature of business and conducts visitors to appropriate persons, may arrange travel schedules and reservations, compiles and types statistical reports, keeps personnel records and records minutes of staff meetings. Handles information and well samples.

CONTROLS OVER POSITION:

Responsible to Director of Division of Water Quality.

MINIMUM QUALIFICATIONS:

High School graduate, supplemented by courses in typing or other business subjects. Must have knowledge of computer terminal operation and general computer terminal experience.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________

POSITION TITEL: Assistant Director

DEPARTMENT: Division of Water Quality

DIVISION: Administration

INTRODUCTION:

This position is responsible for assisting in the supervision, coordination and management of the Division of Water Quality.

DUTIES AND RESPONSIBILITIES:

Incumbent assists in the supervision, coordination and management of all activities of the Division of Water Quality. Assists in the

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enforcement of federal, state and district Water Pollution Control laws. Aids in instituting legal actions and the writing of new laws concerning water problems.

Helps prepare the Division of Water Quality budget. Aids in the preparation of yearly report to the Indiana State Board of Health. Attends management staff meetings and occasionally attends constructive workshops or seminars.

Assists in establishing work policies and procedures for the the Division of Water Quality and the placement of all personnel. Evaluates and institutes new testing procedures with Division Director. Participates in decisions concerning testing frequencies and new testing set-up procedures.

CONTROLS OVER POSITION:

Responsible to Director, Division of Water Quality. Position is subject to 24 hour emergency call.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in one of the Environmental or Professional Sciences. Must have some management and supervisory experience.

Must have a general working knowledge of federal, state and district laws concerning water control. Must have knowledge of laboratory equipment and testing methods. Should have a working knowledge of industrial pre-treatment techniques.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________

POSITION TITLE: Biologist

DEPARTMENT: Division of Water Quality

DIVISION: Industrial Stream & Surveillance Section

INTRODUCTION:

This position is responsible for conducting a variety of biological and chemical examinations for all water quality problems within the Muncie Sanitary District.

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DUTIES AND RESPONSIBILITIES:

The incumbent participates in a variety of biological and chemical examinations relating to water quality control within the Muncie Sanitary District. Participates in a variety of water quality surveys and sampling of industrial and general stream pollution problems. Submits written reports of all examinations performed to the Director of the Division of Water Quality.

Collects and maintains samples from automatic field samplers. Assists with department research projects.

Attends staff meetings. Occasionally attends constructive workshops and seminars.

CONTROLS OVER POSITION:

Receives general supervision from the Director of the Division of Water Quality.

Subject to 24 hour emergency call. Subject to periodic weekend testing based on a rotation schedule.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in Biology.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________

POSITION TITLE: Biologist

DEPARTMENT: Division of Water Quality

DIVISION: Biological Surveillance Section

INTRODUCTION:

This position is responsible for conducting a variety of biological studies and research pertaining to water quality management within the Muncie Sanitary District.

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DUTIES AND RESPONSIBILITIES:

The incumbent participates in a variety of biological studies relating to water quality control within the Muncie Sanitary District. Submits written reports of all examinations performed to the Director of the Division of Water Quality.

Attends staff meetings. Occasionally attends constructive workshops and seminars.

CONTROLS OVER POSITION:

Receives general supervision from the Director of the Division of Water Quality.

Subject to 24 hour emergency call. Subject to periodic weekend testing based on a rotation schedule.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in biology.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________________

POSITION TITLE: Bacteriologist

DEPARTMENT: Division of Water Quality

DIVISION: Bacteriological Section

INTRODUCTION:

This position is responsible for conducting a variety of bacteriological examinations for all water quality problems within the Muncie Sanitary District.

DUTIES AND RESPONSIBILITIES:

The incumbent supervises and participates in a variety of bacteriological examinations relating to water quality control in the Muncie Sanitary District. Tests, including total coliform, fecal coliform, fecal streptococci, salmonella and others are performed on a daily or weekly basis in accordance with Federal, State and District regulations. Submits daily written reports of all examinations performed to the Director of the Division of Water Quality.

Supervises the preparation of various media to be used in analysis. Sets up procedures for testing. Orders supplies and necessary equipment for the laboratory with the Director's approval. Maintains and cleans laboratory equipment.

Assists with department research projects. Attends staff meetings. Occasionally attends constructive workshops and seminars.

CONTROLS OVER POSITION:

Receives general supervision from the Director of the Division of Water Quality.

Subject to 24 hour emergency call. Subject to periodic weekend testing based cn a rotation schedule.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in biology with an emphasis in bacteriology.

MUNCIE, INDIANA

MUNICIAPL SERVICE

POSITION DESCRIPTION

DATE: ____________________

POSITION TITLE: Chemist

DEPARTMENT: Division of Water Quality

DIVISION: Chemistry Section

INTRODUCTION:

This position is responsible for conducting a variety of chemical examinations for all of water quality problems within the Muncie Sanitary District.

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DUTIES AND RESPONSIBILITIES:

The incumbent supervises and participates in a variety of chemical examinations relating to Water Quality Control in the Muncie Sanitary District. Tests including B.O.D., suspended and total solids, heavy metals, phosphates, ammonia, and others, are performed on a daily or weekly basis in accordance with Federal, State and District reguations.

Prepares reagents and standard solutions for laboratory analysis. Sets up procedures for testing. Maintains and cleans laboratory equipment. Collects and maintains samples from the automatic samplers of the Municipal Wastewater Treatment Plant.

Attends staff meetings. Occasionally attends constructive workshops and seminars. Helps with department research projects.

CONTROLS OVER POSITION:

Receives general supervision from the Director of the Division of Water Quality.

Subject to 24 hour emergency call. Subject to periodic weekend testing based on a rotation schedule.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in chemistry.

MUNCIE, INDIANA

MUNICIPAL SERVICE

POSITION DESCRIPTION

DATE: ______________________

POSITION TITLE: Assistant Chemist

DEPARTMENT: Division of Water Quality

DIVISION: Chemistry Section

INTRODUCTION:

This position assists in general water quality testing and laboratory duties.

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DUTIES AND RESPONSIBILITIES:

The incumbent performs laboratory related duties as directed by the Chief Chemist or Chemist. Assists in the collection and testing of samples and in the preparation or reagents and solutions. Assists in the maintenance of laboratory facilities and cleaning of all equipment. Performs other duties as directed.

CONTROLS OVER POSITION:

The incumbent receives special instruction and supervision on new procedures with which he/she is unfamiliar. Performs routine tasks with direct review by Chief Chemist or Chemist.

MINIMUM QUALIFICATIONS:

Must have a Bachelor of Science degree in one of the Environmental or Professional Sciences.

APPENDIX D

DIVISION OF WATER QUALITY
SURVEILLANCE SECTION

Survey Date__________ Time________ Bottle#________________

Type of Survey____________________________

Installation______________ Stream Name________________

Location______________________________

Type of Sample: 8-Hour____ 24-Hour____ Spot_____ User Chg____________

Temp._____ °C D.O.____ ppm %Sat.____

Sample Location # __________

WASTE PRODUCTS:

____ Alkalinity	____ As	Coliform Dilution ____________
____ BOD	____ Cd	Strep Dilution ____________
____ Cl^-	____ Cr	Total Coliform ________ per 100 ml
____ Cl_2	____ Cu	Fecal Coliform ________ per 100 ml
____ CN^-	____ Fe	% Fecal ________ %
____ NH_3-N	____ Mn	Fecal Strep ________ per 100 ml (For non-ideal colony count)
____ NO_3-N	____ Ni	
____ Oil	____ Pb	$\frac{FC}{FS}$: ____________
____ pH	____ Se	
____ PO_4-P	____ Ti	
____ SS	____ Zn	FS ≥ ______ col.
____	____	

COMMENTS:____________________________________

____

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INVESTIGATOR:____________________

DATE OF REPORT:________ TESTS RUN BY:____________________

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Taxonomic Summary Sheet

Stream________________ Station________________ Date________________________

Sample / Taxa									

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PLANT TESTING

Date:______________ 19______

EFFLUENT (FINAL: BY-PASS Cl_2)

Tube #	Quantity	Lauryl tryptose Turbid	Gas	Brilliant Green Bile	Fecal
1	.0001				
2	.0001				
3	.0001				
4	.00001				
5	.00001				
6	.00001				
7	.00001				
8	.000001				
9	.000001				
Control	.000001				

Total coliform pre & con MPN:________________per 100 ml

Fecal MPN:________________per 100 ml

EFFLUENT (TERTIARY)

Cl_2=________________ppm

Tube #	Quantity	Lauryl tryptose Turibd	Gas	Brilliant Green Bile	Fecal
1					
2					
3					
4					
5					
6					
7					
8					
9					
Control					

Total coliform pre & con MPN:________________per 100 ml

Fecal MPN:________________per 100 ml

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(4-76)

PLANT TESTING

Date:________________ 19________

INFLUENT (RAW)

Tube #	Quantity	Lauryl tryptose		Brilliant Green Bile	Fecal
		Turbid	Gas		
1	.0001				
2	.0001				
3	.0001				
4	.00001				
5	.00001				
6	.00001				
7	.00001				
8	.000001				
9	.000001				
Control	.000001				

Total coliform pre & con MPN:__________________per 100 ml

Fecal MPN:__________________per 100 ml

EFFLUENT (FINAL THROUGH Cl_2) Cl_2=________________ppm

Tube #	Quantity	Lauryl tryptose		Brilliant Green Bile	Fecal
		Turibd	Gas		
1					
2					
3					
4					
5					
6					
7					
8					
9					
Control					

Total coliform pre & con MPN:__________________per 100 ml

Fecal MPN:__________________per 100 ml

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET

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PCA

SAMPLE: ____________________

DATE: ____________________

Dilution	Plate 1	Plate 2	Plate 3	Average	Total/100 ml

PCA COLONY DESCRIPTIONS

SAMPLE: ____________________

DATE: ____________________

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DIVISION OF WATER QUALITY
ASTACIDAE FAUNISTIC COLLECTION

Name of Stream__________________ County________________ Date__________

Station No.__________________ Temp: Air:________________

Width__________________ Water:________________

Depth__________________ Time________________

Turbidity__________________ Collectors________________

Vegitation__________________ ________________

Substrate__________________ ________________

Remarks____________________________________

____

____

I. D. Number	Sex	Taxa	Remarks

BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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Division of Water Quality
Surveillance Section
Dye Testing

Survey Date______________ Time______________

Occupants Name and Address______________________________
____
____

Own________ Rent________

Owner's Name and Address______________________________
____
____

Specific Location of dye test______________________________
____
____

Results

Positive_____ Negative_____

Time________ Time________

Comments______________________________
____
____

Investigator______________________________

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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AQUATIC INSECT REARING WORKSHEET

Name of Stream________________ **Water Temp**________________

County________________ Air Temp________________

Location________________ Time of Collection________________

Date Collected________________ Collector(s)________________

____

Comments________________________________

____

____

Field Storage & Retrieval________________________________

____

____

Type Rearing:
Individual Vial_____ Individual Aquaria_____ Batch_______

Substrate Type________________________________

____

Results

Date of Emergence	Non-Emergence	Adult ♂	Adult ♂	Larval Exuvia	Pupal Exuvia	Vial	Slide	Taxa/Author
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

% Emergence_______ **% Males**_____ **% Females**_____

BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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208 STREAM SURVEY

Stream Name ____________________

Station Location ____________________________________

Station Number __________________

Date __________________________

Time	DO mg/l	Temp °C

Bacterial Analysis

Time ____________

Colonies per 100 ml

Total Coliform __________________________

Fecal Coliform __________________________

Fecal Strep ____________________________

Colonies per 100 ml

Chemical Analysis of Composite Samples

Alkalinity		Cd	
BOD		Cr	
Cl		Cu	
NH_3-N		Fe	
NO_3-N		Mn	
pH		Ni	
PO_4-P		Pb	
SS		Zn	

All parameters except pH reported in mg/l

Flow Analysis

Time _______ Flow ________

Comments ____

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
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PLANT TESTING

DATE_______________

Sample Site	pH	^oC	ppm D.O.	ppm Cl_2	ppm BOD	ppm PO_4-P	ppm NH_3-N	ppm Sus.S.	% Set.S.	SVI	% TS	% VS	ppm V.S.S.	Vol. Acid ppm	ppm Alk
Raw		XXXXX	XXXXXXX	XXXXXX					XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Primary Old		XXXXX	XXXXXXX	XXXXXX		XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Primary New		XXXXX	XXXXXXX	XXXXXX		XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Seconday Effluent		XXXXX	XXXXXXX	XXXXXX		XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Final									XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Aerator Old	XXXXXXX	N___ S___	N___ S___	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX				XXXXX	XXXXX		XXXXX	XXXXX
Aerator New	XXXXXXX	E___ W___	E___ W___	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX				XXXXX	XXXXX		XXXXX	XXXXX
Ret. Sludge Old	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Ret. Sludge New	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Primary Sludge	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX			XXXXXX	XXXXX	XXXXX
Digester #6	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX			XXXXXX		
Digester #5	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX			XXXXXX		
Supernatant	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX		XXXXX	XXXXXX	XXXXX	XXXXX
Tillotson	XXXXXXX			XXXXXX					XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Nebo	XXXXXXX			XXXXXX					XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Digested Sludge	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX
Clarivac R. Sludge	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXX	XXXXXXX	XXXXXXX		XXXXXXXX	XXXXXXX	XXXXX	XXXXX	XXXXXX	XXXXX	XXXXX

COMMENTS:

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA OUTSIDE DIMENSIONS FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

SAMPLE____________________ MONTH________________________

DATE	TOTAL COLIFORM /100 ml	FECAL COLIFORM/100 ml
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
N=	Σ= Σ/N= (2 sig)	Σ= Σ/N= (2 sig)

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

No.	GAME FISHES	Size Range	No.	FORAGE FISHES	Size Range
	COARSE FISHES				
	OBNOXIOUS FISHES				

EPA-287 (Cin.)
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Date____________

Time____________

	Suspended Solids	Settleable Solids	Sludge Volume Index
Aerator Old			
Aerator New			
Return Old			
Return New			

Date____________

Time____________

	Suspended Solids	Settleable Solids	Sludge Volume Index
Aerator Old			
Aerator New			
Return Old			
Return New			

Date____________

Time____________

	Suspended Solids	Settleable Solids	Sludge Volume Index
Aerator Old			
Aerator New			
Return Old			
Return New			

Date____________

Time____________

	Suspended Solids	Settleable Solids	Sludge Volume Index
Aerator Old			
Aerator New			
Return Old			
Return New			

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OTTOM OF MAGE ARE UTSIDE DIMENSION FOR TABLE AND ILLUS TRATIONS
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County________________
Location______________________________
Species_______________________________

Fish Collection Field Sheet
Surveillance Section
Division of Water Quality

Station________________
Recorder_______________________
Date__________________________

Number																		
ength & Weight Date (mm & g)	L	W	L	W	L	W	L	W	L	W	L	W	L	W	L	W	L	W	
0-55																		
56-105																		
06-155																		
56-205																		
06-255																		
56-305																		
06-355																		
56-405																		
06-455																		
56-505																		
06-555																		
56-605																		
06-655																		
56-705																		
06-765																		
66-805																		
06-855																		
56-905																		

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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STREAM TESTING

Date: ____________________19_____

Location: ______________________________Stream Name: ____________________

Tube #	Quantity	Lauryl tryptose Turbid	 Gas	Brilliant Green Bile	Fecal
1					
2					
3					
4					
5					
6					
7					
8					
9					
Control					

Total coliform pre & con MPN: ______________________________ per 100 ml

Fecal MPN: _______________ per 100 ml

Fecal Strep: _______________ per 100 ml (for non-ideal colony count)

Date: ____________________19_____

Location: ______________________________Stream Name: ____________________

Tube #	Quantity	Lauryl tryptose Turbid	 Gas	Brilliant Green Bile	Fecal
1					
2					
3					
4					
5					
6					
7					
8					
9					
Control					

Total coliform pre & con MPN: ______________________________ per 100 ml

Fecal MPN: _______________ per 100 ml

Fecal Strep: _______________ per 100 ml (for non-ideal colony count)

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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PLANT TESTING

Suspended Solids Date Samples Collected

Sample	NO	VOL	pH	% Set	SVI	Dish	Dish + Dry	Dish Res.	mg/l SS	mg/l VSS
Raw										
P.O.										
P.N.										
Sec.										
Final										
A.O.										
A.N.										
R.S.O.										
R.S.N.										
R.S.C.V.										
Til										
Nebo										

Total + Volatile Solids

	PRIM	DIG. #6	DIG. #5	SEC. DIG.	SUPE.
Dish #					
Dish Only					
D + Samp.					
Samp					
D + Dry					
Dry					
D + Res.					
L.O.V.					
% Sol.					
% Vol.					
Alk.					
Vol. Acids					

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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lved Oxygen Date Taken:

	ON	OS	NE	NW	Final	Til.	Nebo
Temp.							
D.O. mg/l							

BOD Date Taken:

Sample	Bot #	% Dil.	In Do	Fin Do	Mg/1 BOD	Ave BOD
Blank						
Sd. Blk.						
Std.						
Raw						
Prim.						
Sec.						
Final						
Til.						
Nebo						

Cl_2 DPD

Time	
Date	
Conc	

Total PO_4-P Date

	Abs.	Conc.
Std.		
Raw		
Sec.		
Fin.		

NH_3-N

		Conc.
Std.		
Raw		
Sec.		
Fin.		
Til.		
Nebo		

BACTI

Raw
Total Coli.__________/100 ml
Fecal Coli.__________/100 ml
% Fecal__________%

Final
Total Coli.__________/100 ml
Fecal Coli.__________/100 ml
% Fecal__________%

By-pass
Total Coli.__________/100 ml
Fecal Coli.__________/100 ml
Fecal__________%

Tillotson
Total Coliform__________/100 ml
Fecal Coliform__________/100 ml
% Fecal__________%
Fecal Strep__________/100 ml
(For non-ideal colony count)
FC:
FS:

Nebo
Total Coliform__________/100 ml
Fecal Coliform__________/100 ml
% Fecal__________%
Fecal Strep__________/100 ml
(For non-ideal colony count)
FC:
FS:

BEGIN LAST LIN OF TEXT
3/8"
OTTOM OF IAGE AREA; UTSIDE MENSION FOR TABLES AND ILLUSTRATIONS

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TEXT
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OF PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

Heavy Metal Analysis

Date____________________

Metal____________________

Conc. of Std.	Abs.				Ave.

#	Abs	Conc	#	Abs	Conc	#	Abs	Conc

Baseline Drift ± ____________ Mode__________________ ____________nm

D_2BC _____ Sensitivity______________________________

CC _____ Onset ______ Magnitude__________________________

Concentration Variation ± ____________________ Slit______________

Time Start ________________ Time Stop________________________

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSIONS
FOR TABLES
AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

Date________
Time________

Dissolved Oxygen in Aerators

d North________
d South________
w East________
w West________
nal________

Date________
Time________

Dissolved Oxygen in Aerators

Old North________
Old South________
New East________
New West________
Final________

Date________
Time________

Dissolved Oxygen in Aerators

d North________
d South________
w East________
w West________
nal________

Date________
Time________

Dissolved Oxygen in Aerators

Old North________
Old South________
New East________
New West________
Final________

Date________
Time________

Dissolved Oxygen in Aerators

d North________
d South________
w East________
w West________
nal________

Date________
Time________

Dissolved Oxygen in Aerators

Old North________
Old South________
New East________
New West________
Final________

Date________
Time________

Dissolved Oxygen in Aerators

d North________
d South________
w East________
w West________
nal________

Date________
Time________

Dissolved Oxygen in Aerators

Old North________
Old South________
New East________
New West________
Final________

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